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62D CONGRESS : : 3D SESSION

DECEMBER 2, 1912-MARCH 4, 1913

SENATE REPORTS

(PUBLIC)

VOL. 2

WASHINGTON : : GOVERNMENT PRINTING OFFICE : : 1913

168912

62d Congress, 3d Session. } SENATE. { Report No. 1210.

RIVER AND HARBOR BILL.

February 11 (calendar day, February 14) 1913.—Ordered to be printed.

Mr. Nelson, from the Committee on Commerce, submitted the following

REPORT.

[To accompany H. R. 28180.]

The Committee on Commerce, to whom was referred the bill (H. R. 28180) making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes, having considered the same, submit the following report, giving such extracts from the report of the Chief of Engineers, United States Army, and other official documents in respect to each item as are deemed essential to an appreciation of its merits.

The bill as it came from the House carried—

Appropriations aggregating	$37,112,958
And authorizations of contracts to be provided for by future appropriations amounting to	3,760,000
Total	40,872,958

The net increases in the bill as reported to the Senate are:

Appropriations	$3,982,987
Contracts authorized	3,235,800
Total increase	7,218,787

The bill as reported to the Senate therefore carries appropriations aggregating $41,095,945 and authorizations of continuing contracts amounting to $6,995,800, giving a grand total of $48,091,745.

For list of increases and decreases by committee amendments see final pages.

The "continuing-contract" provision was first introduced in the river and harbor act of 1890, applying to but five items in that act, but to increasing numbers in succeeding bills, excepting the act of 1894, which contained no such provision. Since the inauguration of annual river and harbor acts, in 1909, the number of such items has decreased, and the present act has but two—for the Hudson and Ohio Rivers.

The amount yet to be appropriated for contracts authorized by previous acts is $25,263,924. The sundry civil act of this year should carry about one-half of this amount.

In the past 17 years there have been 8 general and 3 emergency river and harbor acts, making provisions as follows:

1896.	Appropriations	$12,659,550	
	Contracts authorized	59,616,405	
			$72,275,955
1899.	Appropriations	[1] 15,841,841	
	Contracts authorized	[1] 21,548,324	
			37,390,165
1900.	Appropriation (emergency)		560,000
1902.	Appropriations	26,771,442	
	Contracts authorized	38,586,160	
			65,357,602
1904.	Appropriation (emergency)		3,000,000
1905.	Appropriations	18,181,875	
	Contracts authorized	17,184,657	
			35,366,532
1907.	Appropriations	37,108,083	
	Contracts authorized	49,954,349	
			87,062,432
1909.	Appropriation (emergency)	9,435,750	
	Contracts authorized	635,875	
			10,071,625
1910.	Appropriations	41,327,238	
	Contracts authorized	10,618,605	
			51,945,843
1911.	Appropriations	31,028,419	
	Contracts authorized	13,101,645	
			44,130,064
1912.	Appropriations	31,059,370	
	Contracts authorized	2,200,000	
			33,259,370

Appropriations for work under continuing contracts have been principally in sundry civil, rarely in deficiency, acts. Previous to the inauguration of annual river and harbor acts, appropriations other than those for continuing-contract work have occasionally appeared in sundry civil acts, providing for emergencies in river and harbor work.

Appropriations in all the above-mentioned acts, for river and harbor improvements, during the years named have been as follows:

1896.	River and harbor act	$12,659,550	
	Sundry civil act	3,284,597	
			$15,944,147
1897.	Sundry civil act	19,121,412	
	Deficiency acts	1,450,000	
			20,571,412
1898.	Sundry civil act	14,061,613	
	Deficiency act	100,000	
			14,161,613
1899.	River and harbor act	15,841,841	
	Sundry civil act	8,918,197	
			24,760,038
1900.	River and harbor act	560,000	
	Sundry civil act	15,725,605	
			16,285,605
1901.	Sundry civil act		7,046,623
1902.	River and harbor act	26,771,442	
	Sundry civil act	5,768,757	
			32,540,199
1903.	Sundry civil act		20,228,150
1904.	River and harbor act	3,000,000	
	Sundry civil act	7,872,200	
			10,872,200

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[1] As amended by act of Feb. 20, 1900.

1905.	River and harbor act	$18,181,875	
	Sundry civil act	10,544,132	
			$28,726,007
1906.	Sundry civil act		17,254,050
1907.	River and harbor act	37,108,083	
	Sundry civil act	6,392,730	
			43,500,813
1908.	Sundry civil act		18,092,945
1909.	River and harbor act	9,435,750	
	Sundry civil act	19,754,514	
			29,190,264
1910.	River and harbor act	41,327,238	
	Sundry civil act	8,051,428	
			49,378,666
1911.	River and harbor act	23,855,342	
	Sundry civil act	7,028,077	
			30,883,419
1912.	River and harbor act	31,059,370	
	Sundry civil act	9,500,250	
			40,559,620

The total of appropriations for rivers and harbors and related works from the beginning to June 30, 1911, is $737,870,967.56.[1]

The annual expenditures for river and harbor improvements since 1895, as stated in the annual reports of the Chief of Engineers, have been as follows:

1896	$17,039,731.00
1897	13,461,395.00
1898	17,161.799.00
1899	15,167,294.00
1900	18,671,340.00
1901	19,621,227.00
1902	15,301,148.00
1903	18,251,217.00
1904	23,843,304.86
1905	$24,648,697.00
1906	24,115,597.00
1907	23,092,070.00
1908	28,251,972.00
1909	36,753,285.00
1910	29,685,583.00
1911	32,457,012.00
1912	35,643,918.00

In addition to the appropriations given above, the following amounts have been disbursed from funds contributed by States, municipalities, and private parties in recent years:

1906.

Citizens of St. Joseph, Mo., for improving Missouri River	$35,177.59
Citizens of Dallas, Tex., for improving Trinity River	1,277.45
	36,455.04

1907.

Citizens of St. Joseph, Mo., for improving Missouri River	3,806.72
Citizens of Dallas, Tex., for improving Trinity River	7,076.47
	10,883.19

1908.

Citizens of St. Joseph, Mo., for improving Missouri River	6,840.69
State of Washington, for improving Columbia River above Celilo	13,159.66
State of Washington, for improving Snake River	47,377.31
Railroad companies, for improving Missouri River at Elwood, Kans	36,679.69
Railroad companies and private interests, for improving Puyallup Waterway, Tacoma, Wash	7,798.95
	111,856.30

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[1] See Report of Chief of Engineers, 1912, p. 31.

1909.

Citizens of St. Joseph, Mo., for improving Missouri River	$4,179.85
State of Washington, for improving Snake River	26,786.75
State of Washington, for improving Columbia River above Celilo	11,840.34
Railroad companies, for improving Missouri River at Elwood, Kans	13,290.61
Railroad companies and private interests, for improving Puyallup Waterway, Tacoma, Wash	61,557.50
Citizens of Dallas, Tex., for improving Trinity River	6,316.52
Cape May Real Estate Co., for improving Cold Spring Inlet, N. J	2,800.41
State of Rhode Island, for improving Pawtucket River	19,933.24
Citizens of Oregon, for improving Coos Bay	21,270.41
	167,975.63

1910.

State of Massachusetts, for improving Essex River	5,000.00
Citizens of Dallas, Tex., for improving Trinity River	12,756.90
State of Rhode Island, for improving Pawtucket River	25,405.97
State of Washington, for improving Snake River	10,835.94
Railroad companies and private interests, for improving Puyallup Waterway, Tacoma, Wash	58,986.94
Cape May Real Estate Co., for improving Cold Spring Inlet, N. J	66,421.15
City of Wilmington, Del., for improving Wilmington Harbor	500.00
Citizens of Hartsburg, Mo., for improving Missouri River	10,000.00
Sioux City Stock Yards Co., for improving Missouri River	1,326.62
Railroad companies, for improving Missouri River at Elwood, Kans	29.70
	191,263.22

1911.

State of California, for improvement of Sacramento and Feather Rivers, Cal	$12,839.03
Citizens of Dallas, Tex., for improvement of Trinity River, Tex	28,831.01
State of Rhode Island, for improvement of Pawtucket River, R. I	1,644.71
Cape May Real Estate Co., for improvement of Cold Spring Inlet, N. J	5,936.44
City of Wilmington, Del., for improvement of Wilmington Harbor, Del	195.76
Citizens of Craig, Mo., for improvement of Missouri River	4,491.73
Sioux City Stock Yards Co., for improvement of Missouri River	225.86
	54,164.54

1912.

State of California, for improvement of Sacramento and Feather Rivers, Cal	$2,245.85
Citizens of Dallas, Tex., for improvement of Trinity River, Tex	9,834.23
Local interests, for improvement of Sabine-Neches Canal, Tex	14,779.32
State of Rhode Island, for improvement of Pawtucket River, R. I	19,849.93
Cape May Real Estate Co., for improvement of Cold Spring Inlet, N. J	2,000.00
City of Wilmington, Del., for improvement of Wilmington Harbor, Del	6,541.34
City of Augusta, Ga., for improvement of Savannah River, at Augusta	55,183.32
itizens of Sioux City, Iowa, for improvement of Missouri River at Sioux City	15,208.20
Union Terminal Railway Co., for improvement of Missouri River at St. Joseph, Mo	3,000.00
Chicago & Alton Railway Co., for improvement of Missouri River at Glasgow, Mo	4,167.23
	132,809.42

RAIL AND WATER FREIGHT RATES.

In Poor's Manual for 1912 it is stated that the average railroad rate in the United States per ton-mile in 1911 was 7.48 mills. In the same year the average charge per ton-mile for freight transported through St. Marys River between Lake Superior and lower Lake ports was two-thirds of 1 mill.

The Board of Engineers that submitted the existing project for the improvement of Ohio River (H. Doc. No. 492, 60th Cong., 1st sess.) estimated that a 6-foot channel in that river would permit such freight as coal to be transported at a rate of 0.653 of a mill per ton per mile, and that a 9-foot channel would bring this rate down to 0.447 of a·mill; and experiments on this river in its partially improved condition with the towboat *Sprague* and barges have shown that with 9 feet depth of water the downstream transportation of coal on such a sheltered waterway can be done at as low a cost as has yet been reached on the Great Lakes.

The following table is taken from an interesting discussion on waterway transportation printed in report of an examination of the Des Moines River, in House Document No. 1063, Sixty-second Congress, third session:

Population of river and lake cities and percentage of water rates as compared with rail rates.

RIVER CITIES.

Year.	Pittsburgh.		Cincinnati.		Louisville.		St. Louis.		Memphis.	
	Population.	Rate.	Population.	Rate.	Population.	Rate.	Population.	Rate.	Population.	Rate.
		Per cent.		*Per cent.*		*Per cent.*		*Per cent.*		*Per cent.*
1870	86,076	75	216,239	34	100,753	48	310,864	93	40,226	78
1880	156,389	82	255,139	18	123,758	23	350,518	13	[1] 33,592	−16
1890	238.617	53	296,908	16	161,129	31	451,770	29	64,495	92
1900	321,616	31	325,902	10	204,731	27	575,238	27	102,320	59
1910	[2] 533,905	66	364,463	12	223,928	9	687,029	19	131,105	28

[1] Decrease probably owing to yellow fever epidemics.
[2] Included Allegheny City, etc., by annexation.

LAKE CITIES.

Year.	Buffalo.		Cleveland.		Detroit.		Milwaukee.		Chicago.	
	Population.	Rate.	Population.	Rate.	Population.	Rate.	Population.	Rate.	Population.	Rate.
		Per cent.		*Per cent.*		*Per cent.*		*Per cent.*		*Per cent.*
1870	117,714	45	92,829	114	79,577	74	71,440	58	298,977	174
1880	155,134	32	160,146	72	116,340	46	115,587	62	503,185	68
1890	255.664	65	261,353	63	205,876	77	204,468	77	1,099,850	119
1900	352,387	38	381,768	46	285,704	39	285,315	39	1,698,575	54
1910	423,715	20	560,663	47	465,766	63	373,857	31	2,185,283	29

A discussion of the saving in freight rates affected by water facilities is included in the report on Duluth-Superior Harbor herein

Following is the report of the House committee on the bill:

[Report to accompany H. R. 28180.]

The Committee on Rivers and Harbors, having had under consideration House bill 28180, files the same and respectfully reports thereon, recommending that the bill do pass.

The bill carries $40,872,958—$37,112,958 in cash appropriations and $3,760,000 in authorizations, the authorizations being $3,200,000 for the Ohio and $560,000 for the Hudson River. This aggregate exceeds the amount carried in the last bill as it was introduced into and as it left the House by $14,610,438. But this increase was made necessary by reason of the fact that the appropriations in the pending measure are intended to cover a much longer period of time than those carried in the bill of 1912. In that bill, which amounted to $26,262,520, we were only providing for a period, as it was supposed, from July 1 last year to March 4 of this, or about eight months, whereas it is necessary in the pending measure to cover the time between the 4th of March next and the 1st of July, 1914, or a period of about 16 months.

In addition to this, other conditions have arisen to increase the amount of the appropriations over those in the last bill. In that measure a large number of new projects were adopted with relatively small initial appropriations, which made necessary larger estimates for this bill. So that, all things considered, the amount of the present bill is not out of proportion, when considered with reference to the bill of 1912.

The estimates furnished by the Chief of Engineers for the prosecution of work upon old projects or those under way and for maintenance was $43,829,010, but the sum of the appropriations for those purposes is less than the estimates by $4,975,000. This result was reached after carefully going over the estimates with the Chief of Engineers or one of his assistants and reducing the amounts below these estimates in some cases and eliminating others entirely where the committee thought that course advisable. The committee believed that there were sufficient funds on hand to prosecute the work on the projects thus passed by until another bill can be enacted in which additional amounts may be furnished. In a few instances the sums allowed were larger than those recommended by the engineers, but such increases, as well as all reductions, were made upon the recommendation, or with the approval, of that officer, whom we freely consulted.

Of the total amount of appropriations recommended, $38,854,010, as may be seen, is for the prosecution of work upon old projects, something like 150 in number, and for maintenance of such as have already been completed and for surveys. The maintenance items total $2,222,650, a remarkably small amount for a little more than one year's operations, when the value and cost of the completed works are considered.

The bill also carries 21 new items calling for $9,183,220 to complete, but of this we have only allowed $2,018,948—a small amount, but enough to begin and prosecute the work on each project until the next annual bill shall have been enacted. These new items were selected from a list of something like 60 projects reported by the engineers within the last few years, requiring for completion about $60,000,000. But the committee, feeling that it could not take care of all of them in the present bill, selected what it thought the most urgent, expecting, of course, that Congress would give consideration to the remaining projects, together with others which might be reported in the next and subsequent bills. That makes the aggregate of the adopted projects, including those in the present bill, about $290,000,000. But this amount embraces a number of large projects, such as the Mississippi, the Missouri, and the Ohio Rivers, requiring for their completion about $170,000,000, the appropriation of which amount will necessarily extend over a long period of time, ranging from 8 to about 16 years.

The bill also differs from the last in the small number of surveys ordered, for while the latter contained provisions for 161 surveys as it passed the House, the present bill only provides for 79, which at least suggests that the demand for new projects is growing less, and that we may hope to reach a point in the not distant future when the requirements of commerce for water transportation facilities will have been substantially met.

Another matter to which the committee gave careful consideration was a demand for more liberal appropriations for levee construction along the banks of the Mississippi River and for the extension of the jurisdiction of the Mississippi River Commission from the mouth of the Ohio to Rock Island, Ill. The sentiment back of these demands was strengthened by the disastrous floods which visited the lower Mississippi River last spring, causing much damage to the river banks and the near-by levees and to property throughout the Mississippi Valley. After careful consideration, however, the committee allowed only $6,000,000, the amount recommended by the Chief of

Engineers, mainly for revetment work, although a part may, under the provisions of the bill, be used for levee construction if, in the opinion of the Mississippi River Commission and the Chief of Engineers, navigation will be benefited thereby.

A further provision in the bill partially extends the jurisdiction of the Mississippi River Commission over levees to Rock Island, Ill. The provision effecting this reads as follows:

"Any funds which have been, or may hereafter be, appropriated by Congress for improving the Mississippi River between the Head of Passes and the mouth of the Ohio River, and which may be allotted to levees, may be expended, under the direction of the Secretary of War, in accordance with the plans, specifications, and recommendations of the Mississippi River Commission, as approved by the Chief of Engineers, for levees upon any part of said river between the Head of Passes and Rock Island, Ill."

There is quite an insistent demand for this extension, the claim being made that there is as much necessity for that class of work above the mouth of the Ohio River and Cape Girardeau as below. Attention is directed to the requirement in the law that the money appropriated for that purpose can only be expended "in such manner" as in the opinion of the Mississippi River Commission and the Chief of Engineers "shall best improve navigation and promote the interests of commerce at all stages of the river."

The bill also changes slightly the provision in the act of 1912 permitting the Chief of Engineers to fix, in his discretion, the number of members of the Board of Engineers for Rivers and Harbors at not more than nine. It was thought best to have a definite rather than an indefinite number, even though a maximum beyond which the increase could not be made was fixed. The committee therefore have provided that the board shall be composed of seven members instead of nine, in the discretion of the Chief of Engineers, seven being regarded as more desirable than the larger number.

Although the original estimates of the engineers have not been followed in all cases, the committee confidently believe that sufficient provision has been made to prosecute expeditiously the work both on old and new projects during the time for which the estimates were made and until the next annual bill is enacted.

Appropriations and authorizations included in river and harbor bill (H. R. 28180) as reported to the House of Representatives, Jan. 16, 1913.

	Appropriations.
Maine:	
Portland Harbor	$150,000
Kennebec River	30,500
Medomac River	8,500
St. Croix River	75,000
Vermont:	
Burlington Harbor	2,000
Narrows of Lake Champlain (Vt. and N. Y.)	6,000
Massachusetts:	
Boston Harbor	25,000
Hyannis Harbor	24,000
Lynn Harbor	84,000
Nantucket Harbor	51,312
Newburyport Harbor	25,000
Pollock Rip Channel	125,000
Merrimac River	10,000
Mystic River	25,000
Rhode Island:	
Providence River and Harbor	164,800
Pawcatuck River (R. I. and Conn.)	6,000
Connecticut:	
Fivemile River, Greenwich and Westport Harbors and Saugatuck River	5,000
Milford Harbor	5,000
New Haven Harbor	10,000
Connecticut River	15,000
Housatonic River	20,000
Mystic River	8,160
Thames River	12,000

	Appropriations.
New York:	
Buffalo Harbor	$167,375
Cape Vincent Harbor	36,000
Flushing Bay	20,000
Gowanus Bay Channels	300,000
Great Sodus Bay	4,000
Great South Bay	5,000
Hempstead Harbor	5,000
Huntington Harbor	5,000
Jamaica Bay	300,000
Mattituck Harbor	10,000
New York Harbor, including Ambrose Channel	200,000
Ogdensburg Harbor	37,970
Olcott Harbor	4,000
Oswego Harbor	110,000
Plattsburg Harbor	4,000
Port Chester Harbor	15,000
Rondout Harbor	5,000
Saugerties Harbor	2,500
Bronx River	130,000
Browns Creek	10,000
East Chester Creek	20,000
East River and Hell Gate	250,000
Harlem River	100,000
Hudson River	[1] 1,000,000
Newtown Creek	30,000
Wappinger Creek	3,500
Westchester Creek	12,000
New York and New Jersey: Staten Island Sound and Channel north of Shooters Island	530,000
New Jersey:	
Keyport Harbor, Matawan Creek, Raritan and South Rivers, Shoal Harbor, and Compton and Cheesequake Creeks	33,500
Raritan Bay	20,000
Absecon Creek	1,600
Alloway Creek	5,000
Cooper River	5,000
Delaware River, Philadelphia to Trenton	20,000
Delaware River at Trenton	114,000
Elizabeth River	15,443
Hackensack River	50,000
Mantua Creek	15,000
Maurice River	30,000
Newark Bay and Passaic River	300,000
Raccoon Creek	13,000
Salem River	15,000
Shrewsbury River	10,000
Toms River	1,000
Tuckerton Creek	5,000
Woodbridge Creek	3,000
Woodbury Creek	8,000
Pennsylvania:	
Delaware River, Philadelphia to the sea	1,750,000
Pittsburgh Harbor	5,000
Allegheny River	2,000
Monongahela River	178,200
Delaware:	
Wilmington Harbor	30,000
Appoquinimink, Murderkill, and Mispillion Rivers	27,000
Broad Creek River	2,000
Broadkill River	5,000
Leipsic River	5,000
Little River	1,000
St. Jones River	5,000
Inland waterway, Rehoboth Bay to Delaware Bay	41,725

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[1] Continuing contracts to amount of $560,000 additional authorized.

	Appropriations.
Maryland:	
Baltimore Harbor	$100,000
Rockhall, Queenstown, Claiborne, and Cambridge Harbors, and Chester, Choptank, Warwick, Wicomico, Pocomoke, La Trappe, Manokin, and Tyaskin Rivers	33,510
Nanticoke River, Del. and Md., and Northwest Branch, Md	3,600
Potomac River at Lower Cedar Point	3,000
Susquehanna River	51,230
District of Columbia:	
Anacostia River	75,000
Potomac River at Washington	30,000
Virginia:	
Channels to Norfolk and at Thimble Shoals	165,500
Norfolk Harbor and approach, including channels at Hospital Point and in branches of Elizabeth River, and channel to Newport News	30,000
James River	75,000
Mattaponi and Pamunkey Rivers and Occoquan Creek	15,000
Onancock River	1,000
Pagan River	1,000
Rappahannock River	25,000
Upper Machodoc Creek	3,200
Virginia and North Carolina: Inland waterway, Norfolk to Beaufort Inlet	800,000
North Carolina:	
Beaufort Harbor	5,000
Beaufort Inlet	10,000
Morehead City Harbor	2,000
Bay River	1,000
Cape Fear River at and below Wilmington	352,940
Fishing Creek	1,500
Neuse and Trent Rivers	12,000
New River and waterways to Beaufort	5,000
Northeast, Black, and Cape Fear Rivers	12,000
Shallotte River	9,845
Swift Creek	500
Waterways connecting Core Sound and Beaufort Harbor	20,000
North Carolina and South Carolina: Waccamaw River	30,000
South Carolina:	
Charleston Harbor	71,616
Winyah Bay	120,000
Great Pedee River	15,000
Santee, Wateree, and Congaree Rivers	60,000
Waterways between Charleston and Alligator Creek	25,000
Georgia:	
Brunswick Harbor	33,250
Savannah Harbor	345,000
Altamaha, Oconee, and Ocmulgee Rivers	40,000
Flint River	15,000
Satilla River	10,000
Savannah River, above Augusta	3,470
Savannah River, below Augusta	125,000
Georgia and Alabama:	
Coosa River—	
Lock and dam at Mayos Bar, near Rome, Ga	30,000
Between Rome, Ga., and Dam 4, Ala	25,000
Lock 4 and Dam 5, Ala	81,000
Georgia and Florida: Waterway between Savannah and Fernandina	100,000
Florida:	
Apalachicola Bay	20,000
Charlotte Harbor	4,000
Channel, Clearwater Harbor through Boca Ceiga Bay to Tampa Bay	3,000
Fernandina Harbor, including entrance through Cumberland Sound, Ga. and Fla	40,000
Hillsboro Bay	200,000
Key West Harbor	15,000
St. Josephs Bay	10,000
St. Lucie Inlet	100,000
St. Petersburg Harbor	1,500

	Appropriations.
Florida—Continued.	
Sarasota Bay	$13,000
Tampa Bay	9,000
Channel Apalachicola River to St. Andrews Bay	130,000
Apalachicola River, Lee Slough, and Chipola River	7,000
Caloosahatchee River	2,000
Crystal River	2,000
Holmes River	2,500
Indian River	22,000
Manatee River	5,000
Orange River	1,000
St. Johns River	611,800
Withlacoochee River	5,000
Florida and Alabama:	
Choctawhatchee River	9,000
Escambia and Conecuh Rivers	8,000
Alabama:	
Mobile Bar	20,000
Mobile Harbor	255,000
Alabama River, including Alabama and Coosa Rivers, between Montgomery and Wetumpka	100,000
Black Warrior, Warrior, and Tombigbee Rivers	1,338,500
Alabama and Mississippi: Tombigbee River from mouth to Walkers Bridge	27,500
Mississippi:	
Biloxi Harbor	5,000
Gulfport Harbor and Ship Island Pass	87,000
Horn Island Pass	5,000
Pascagoula Harbor at mouths of Pascagoula and Dog Rivers and channel through Mississippi Sound and Horn Island Pass to Gulf	110,000
Big Sunflower River	120,000
Pascagoula and Leaf Rivers	14,000
Pearl River	37,000
Wolf and Jordan Rivers	5,000
Yazoo River at the mouth, and harbor of Vicksburg	10,000
Yazoo River and tributaries	40,000
Florida, Mississippi, Louisiana, and Texas: Removal of water hyacinths	15,000
Louisiana:	
Bayous Bartholomew, Macon, D'Arbonne, and Corney, and Boeuf and Tensas Rivers	16,000
Bogue Falia, Bayou Manchac, and Amite, Chefuncte, and Tickfaw Rivers	7,000
Johnsons Bayou	2,500
Bayou Lafourche	2,000
Bayou Queue de Tortue	1,000
Southwest Pass, Mississippi River	500,000
Bayou Teche	40,000
Bayou Vermilion and Mermentau River	16,200
Louisiana and Texas: Waterway, Mermentau River to Sabine River	190,000
Louisiana, Arkansas, Texas, and Oklahoma:	
Red River below Fulton, Ark	75,000
Red River between Fulton and the Washita	42,000
Texas:	
Galveston Channel	200,000
Channel, Galveston Harbor to Texas City	200,000
Port Aransas	500,000
Port Bolivar Channel	50,000
Sabine Pass and Port Arthur Canal	400,000
West Galveston Bay Channel, Trinity River, Anahuac Channel, Oyster Creek, and Cedar, Chocolate, Turtle, Bastrop, Dickinson, Double, and East Bay Bayous	25,000
Brazos River—	
Old Washington to Waco	250,000
Velasco to Old Washington	25,000
Mouth	25,000
Trinity River—	
Locks and dams	255,000
Open-channel work	15,000

	Appropriations.
Texas—Continued.	
Channel, Aransas Pass to Corpus Christi	$10,000
Channel, Pass Cavallo to Port Lavaca	5,000
Inland waterway, coast of Texas—	
West Galveston Bay to Brazos River	10,000
Brazos River to Matagorda Bay	25,000
Guadalupe River to Victoria	15,000
Texas and Louisiana: Cypress Bayou	500
Arkansas and Louisiana:	
Ouachita River—	
Lock and Dam No. 3	175,000
Open-channel work to Camden	25,000
Camden to Arkadelphia	2,500
Arkansas:	
Arkansas River	48,000
Cache River	2,000
St. Francis and L'Anguille Rivers and Blackfish Bayou	7,000
Saline River	3,000
White River	20,000
Arkansas and Missouri: Black and Current Rivers	25,000
Tennessee:	
Cumberland River above Nashville	5,000
Cumberland River below Nashville	5,000
French Broad and Little Pigeon Rivers	15,000
Tennessee, Alabama, and Kentucky:	
Tennessee River—	
Above Chattanooga	510,000
Chattanooga to Browns Island	385,000
Florence to Riverton	100,000
Below Riverton	110,000
Ohio:	
Cleveland Harbor	25,000
Conneaut Harbor	200,000
Port Clinton Harbor	500
Toledo Harbor	105,000
Ohio River:	
Locks and dams	[1] 1,800,000
General open-channel improvement	550,000
Michigan:	
Cheboygan Harbor	14,000
Frankfort Harbor	3,000
Grand Marais Harbor of Refuge	20,000
Ludington Harbor	5,000
Manistee Harbor	246,000
Marquette Bay Harbor of Refuge	5,000
Ontonagon Harbor	9,000
St. Joseph Harbor and River	6,000
Saugatuck Harbor and Kalamazoo River	3,000
South Haven Harbor	3,000
Detroit River, Wyandotte Channel	155,000
Rouge River	5,000
St. Marys River	500,000
Michigan and Wisconsin: Menominee Harbor and River	10,000
Wisconsin:	
Ashland Harbor	40,000
Green Bay Harbor	14,000
Kenosha Harbor	24,000
Kewaunee Harbor	6,000
Port Washington Harbor	4,500
Port Wing Harbor	10,000
Sheboygan Harbor	237,000
Two Rivers Harbor	4,000
Fox River, including Wolf River and harbors on Lake Winnebago	20,000
Minnesota and Wisconsin: Duluth-Superior Harbor	375,280
Minnesota:	
Warroad Harbor and River	2,000
Zippel Bay	1,000

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[1] Continuing contracts to amount of $3,200,000 additional authorized.

	Appropriations.
Minnesota and North Dakota: Red River of the North	$7,500
Indiana: Indiana Harbor	225,000
Illinois and Indiana: Calumet River	20,000
Illinois:	
Waukegan Harbor	18,500
Chicago River	10,000
Illinois River	100,000
Mississippi River:	
Between Head of Passes and Ohio River	6,000,000
Between Ohio and Missouri Rivers	1,000,000
Between Missouri River and Minneapolis	1,500,000
Between St. Paul and Minneapolis	185,000
Missouri River:	
Mouth to Kansas City	2,000,000
Kansas City to Sioux City	150,000
Sioux City to Fort Benton	150,000
Missouri:	
Gasconade River	10,000
Osage River	15,000
California:	
Humboldt Harbor and Bay	20,000
Los Angeles Harbor	121,000
Oakland Harbor	275,000
San Diego Harbor	35,000
San Pablo Bay	40,000
Mokelumne River	1,000
Petaluma Creek and Napa River	18,000
Redwood Creek	3,000
Sacramento and Feather Rivers	40,000
San Joaquin River, McLeod Lake, and Fremont, Stockton, and Mormon Channels	186,132
Suisun Channel	14,500
Oregon:	
Coos Bay Harbor	80,000
Nehalem Bay	100,000
Coquille River	6,000
Siuslaw River	5,000
Willamette and Yamhill Rivers	42,000
Yaquina River	28,000
Columbia and Lower Willamette Rivers below Portland	160,000
Columbia River at the Cascades	100,000
Oregon and Washington:	
Columbia River at the mouth	1,000,000
Columbia River, Dalles Rapids to head of Celilo Falls	600,000
Columbia River and tributaries above Celilo Falls	40,000
Oregon, Washington, and Idaho, Snake River	25,000
Washington:	
Columbia River, Bridgeport to Kettle Falls	25,000
Grays Harbor and Chehalis River	30,000
Cowlitz and Lewis Rivers	23,500
Grays River	500
Skagit River	10,000
Puget Sound and tributary waters	25,000
Waterway, Port Townsend Bay to Oak Bay	62,500
Waterway, Puget Sound to Lakes Union and Washington	5,000
Hawaii: Honolulu Harbor	225,000
Examinations, surveys, and contingencies	250,000
Total cash appropriations	37,112,958
Continuing contracts authorized	3,760,000
Grand total	40,872,958

PORTLAND HARBOR, ME.

This harbor is located in the southwestern part of the State of Maine. The distance from the lighthouse at the entrance to the upper part of the main harbor is about 6 miles.

The entrance to the main part of the harbor of Portland, or the anchorage, has always been good, but before improvement the approach to the inner harbor was obstructed by a shoal known as the Middle Ground, over which the depth was only from 8 to 10 feet at mean low tide, while between it and Stamford Ledge the greatest available depth was only 16 feet. The best part of the wharf front was exposed to swell from the main entrance, which sometimes made it dangerous for vessels to lie at the docks, and along this front the depth was in some places as shallow as 4 feet.

The first work of improvement undertaken by the Government was the construction of the breakwater. This was begun as early as 1836. It was completed in 1874.

The work of deepening the harbor was begun under the act of Congress of 1868, the plan of improvement being to excavate a channel 300 feet wide and 20 feet deep at mean low tide through the southern slope of the Middle Ground and to remove the bar off the Grand Trunk Railroad wharves to the same depth.

The project was modified in 1870 so as to provide for a channel 400 feet wide, and again in 1871 so as to provide for a channel 500 feet wide. In 1872 further modifications were made by including in the project the dredging of Back Cove and the dredging of the inner harbor up to the harbor commissioner's lines to a depth of 16 feet at mean low tide. The project, modified as above described, excepting some dredging in the inner harbor, was completed by 1876. Between 1881 and 1885 the Middle Ground was removed to a depth of 21 feet at mean low tide.

A further deepening of a portion of the harbor to 29 feet at mean low tide was next begun under the project of 1886. To this was subsequently added, in 1890, a small amount of dredging in the upper part of the harbor.

In 1894 the project was extended to cover the widening of the upper part of the 29-foot area and the dredging of a channel 25 feet deep to connect the deep water in the lower part of the harbor with deep water in the upper part. This work was completed in 1894.

By the act of June 3, 1896, Congress adopted a project for dredging to 30 feet at mean low tide over the greater part of the harbor, at an estimated cost of $770,000, and included in the project the further improvement of Back Cove at a combined estimate of $946,250. (See S. Doc. No. 271, 54th Cong., 1st sess.) The same act appropriated $20,000 for beginning work and authorized the making of a contract for its completion.

The latter project was completed in 1902, at a cost which was about $253,000 less than the estimate. By the sundry civil act of March 3, 1905, Congress authorized an amendment to the project by which the 30-foot channel was to be continued up Fore River as far as the Boston & Maine Railroad bridge, a channel of entrance to Back Cove dredged to the same depth, the width in each case to be about 300 feet, and a small area on the south side of the harbor, in front of the old dry dock, also to be dredged. This work was completed in 1908.

Expenditures under the above projects to June 30, 1912, have been $1,515,643.65. The amount regarded as expended for maintenance of improvement is $2,150.68; the amount received from sales is $9.44. All the above projects have been completed, and appropriations have been made to the extent of the authorization of 1896.

The existing project, adopted by the river and harbor act of July 25, 1912, is in accordance with plan printed in House Document No. 489, Sixty-second Congress, second session (with map). It provides for enlarging the deep-water anchorage opposite the eastern end of the city, for excavating rock and other material so as to give a channel 14 feet deep at mean low tide between Grand Trunk and Tukeys bridges at the entrance to Back Cove, for restoring the channel in Back Cove to 12 feet at mean low tide, for redredging a portion of the channel of approach to Back Cove, and to restore the 30-foot depth over the most important part of the main harbor. The estimated cost is $460,000, with about $2,000 annually for maintenance. The act of July 25, 1912, appropriated $100,000 for commencing work under this project.

Operations during the fiscal year 1912 included office work, observation, and supervision.

There are no silt-bearing streams emptying into Portland Harbor and the improved depths are expected to be reasonably permanent. The maximum draft that can be carried to the wharves in Portland Harbor at mean low tide is about 29 feet, and at the upper end of Back Cove about 8 feet. The mean tidal range is 8.9 feet.

Two principal advantages have followed this large improvement. A large and well-sheltered deep-water area has been created under the shelter of the breakwater, and the trans-Atlantic vessels can arrive and depart from their docks at the lowest stages of tide.

The portion of the harbor in which most of the dredging has been done is the lower part of so-called Fore River. This river is crossed by four bridges. Going up the harbor these are: (1) Portland Bridge; (2) bridge of the Boston & Maine Railroad, eastern division; (3) Vaughan Bridge, belonging to the city; (4) bridge of Boston & Maine Railroad, western division. Portland Bridge has a draw 65 feet wide and admits vessels of the largest class coming to Portland. The next bridge has a draw opening of 60 feet, and the city of Portland has recently reconstructed the third bridge with openings of not less than 60 feet. The improvements in the bridges and the new channel afford great relief to the coal trade and other deep-draft commerce, which was formerly much hampered and retarded by lack of room and sufficient water.

The commerce for the calendar year 1911 is given as 3,162,024 short tons, about one-half of which was coal. The value of the commodities is estimated at $96,751,740. The passenger movement amounted to 1,976,114.

It is impracticable to make a definite statement as to the effect of the improvement on freight rates, but a large trans-Atlantic business has been greatly helped, and the capacity of the harbor has kept pace with the increase in size and draft of vessels used in the coal traffic, with the accompanying saving in cost of transportation.

The new appropriation asked for is to be applied to redredging the main harbor and to extending the deep-water anchorage.

Amount (estimated) required to be appropriated for completion of existing project	$360,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	150,000

KENNEBEC RIVER, ME.

Following are extracts from a report on a recent survey printed in House Document No. 746, Sixty-second Congress, second session:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, May 6, 1912.

SIR: I have the honor to submit herewith, for transmission to Congress, reports dated October 31, 1911, and January 13, 1912, with maps, by Lieut. Col. W. E. Craighill, Corps of Engineers, on preliminary examination and survey, respectively, of Kennebec River, channel west of Swan Island, Me., authorized by the river and harbor act approved February 27, 1911.

Swan Island is about 4 miles long and has an average width of about five-eighths of a mile. It is located about 27 miles above the mouth in Kennebec River, dividing the river into two channels, of which the eastern one, being the most used, has been previously improved by the General Government to a depth of 16 feet at mean low tide. The western channel has also been previously improved by the General Government, though to a less extent than the eastern channel, the depth obtained being 10 to 11 feet, but has since been considerably decreased by shoaling. The improvement desired is a channel 12 feet deep, so that vessels may call at Richmond and then proceed through the western channel in either direction, it being impracticable at present for them to turn near the town of Richmond.

The district officer presents estimates of the cost of improvement to various depths, and after a study of the relative advantages of the plans considered, recommends a channel 100 feet wide and 12 feet deep at mean low water, except at the upper shoal, where the depth is proposed to be made 15 feet, together with some repairs to existing jetties, at a total estimated cost of $30,500 and $2,500 annually for maintenance. The division engineer concurs with the district officer in recommending this project.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated April 2, 1912, concurring in a recommendation of the district officer and the division engineer.

After due consideration of the above-mentioned reports, I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors; and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of Kennebec River, channel west of Swan Island, Me., is deemed advisable so far as to secure an available channel width of 100 feet and a depth of 15 feet at mean low water over the upper shoal and a depth of 12 feet in the remainder of the channel, at an estimated cost of $30,500 for first construction, and $2,500 annually for maintenance, these estimates being based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of the entire estimated cost.

Very respectfully,

W. H. BIXBY,
Chief of Engineers, United States Army.

The SECRETARY OF WAR.

Aside from the bulk freight via barges and schooners, the general passenger and transportation facilities are those afforded by the Maine Central Railroad and a line of passenger steamers maintained for many years by the Eastern Steamship Co. and its predecessors. The main line of the Maine Central Railroad connecting Portland, Bath, Augusta, Bangor, and other points in the State, skirts the Kennebec River from Brunswick through Augusta and Waterville, and passes through the village of Richmond. The Eastern Steamship Co. maintains a line of two large boats, which give a service between Boston, Mass., and Augusta, Me., touching at Bath, Richmond, Hallowell, Gardiner, and other points on the Kennebec.

These boats do not ascend the river farther than Gardiner, about 7 miles below Augusta, on account of the narrowness and lack of depth of the river above Gardiner. The passengers and freight are handled between Augusta and Gardiner by a smaller steamer. The railroad business at Richmond for the calendar year 1910 showed that 12,291 tons of freight were handled at that station, and that 15,210 tickets were sold. This last item can not be taken, however, as an accurate aggregate of the number of passengers. The record simply shows the outbound tickets. It may be fairly assumed that the number of inbound passengers is practically similar to the outbound, which would make something over 30,000, but this by no means represents the travel, as the use of mileage is very extensive on the Maine Central Railroad, and the station agent would have no record in this respect. The Eastern Steamship Co. reports for the calendar year 1910 about 2,050 short tons of general merchandise, having an estimated value of about $150,000, and the passenger business as 4,059. The passenger receipts for the year 1910 are given as $6,713.72. In addition to this there were handled by barges and schooners 8,250 tons of lumber and 3,075 tons of coal.

MEDOMAK RIVER, ME.

The following letter of the Chief of Engineers, submitting report on a recent examination, is printed in House Document No. 674, Sixty-second Congress, second session:

War Department,
Office of the Chief of Engineers,
Washington, March 30, 1912.

Sir: I have the honor to submit herewith, for transmission to Congress, reports dated June 30, 1910, by Lieut. Col. G. A. Zinn, Corps of Engineers, and February 21, 1912, with map, by Lieut. Col. W. E. Craighill, Corps of Engineers, on preliminary examination and plan and estimate of cost of improvement of Medomak River, Me., respectively, called for by the river and harbor act approved June 25, 1910.

The improvement desired by those interested in this stream is a channel up to the town of Waldoboro at the head of navigation, 5 feet deep at mean low water and 75 feet wide. A depth of 5 feet or more is already available up to within about 1¼ miles of Waldoboro. The tidal range is 9½ feet.

The district officer has prepared plans for channels of the desired depth 75 feet and 100 feet wide, and recommends the adoption of the channel of lesser width at an estimated first cost of $17,000. He estimates the cost of maintenance of this channel at from $500 to $1,000 per annum for 10 years, after which he believes it will be negligible. The division engineer concurs in the recommendation of the district officer.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith dated March 5, 1912, concurring in the recommendation of the district officer and division engineer.

After due consideration of the above-mentioned reports, I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of Medomak River, Me., is deemed advisable so far as to secure an available channel depth of 5 feet and a channel width of 75 feet increased on curves, at an estimated cost of $17,000 for first construction and from $500 to $1,000 annually for maintenance, these estimates being based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of the entire estimated cost.

Very respectfully,

W. H. Bixby,
Chief of Engineers, United States Army.

The Secretary of War.

All the towns lying along the tidewater of the Medomak River, and along the shores of the estuary and bay below, are actually or potentially tributary to the commerce of the Medomak River. These towns are as follows:

	Population.
Waldoboro, at head of navigation, on the Medomak	3,000
Friendship, on east side of estuary and bay	800
Bremen, on west side of estuary	700
Bristol, on west side of bay	2,600

The combined business of these towns is estimated at $500,000 annually.

ST. CROIX RIVER, ME.

St. Croix River forms a part of the international boundary between the United States and Canada. Whatever may have been its original or natural condition, the present depth at mean low tide is little more than 3 feet at and near Calais, the head of navigation. The width of the 3-foot channel varies from 180 to 500 feet. Extensive lumbering operations under wasteful methods carried on for many years have resulted in large accumulations of sawmill waste, etc., which are in a great measure responsible for the present condition of the stream.

The river has its source in a series of lakes in the State of Maine, on or near the boundary, and flows in a general southeasterly direction for about 100 miles, emptying into Passamaquoddy Bay. The section of the river included in the project for improvement extends downstream from Calais a distance of about 3½ miles. Calais is at the head of navigation and about 14 miles from the mouth of the river. Until the present project no work of improvement has ever been done at this locality by the United States, except the construction of three piers in 1856 and their repair in 1881. The latter work cost $4,000. The river has been examined several times and surveyed, but because of the practice of throwing mill refuse into the stream appropriations made by the United States were diverted, and one by the Canadian Government was not expended. One thousand dollars was expended on survey.

The existing project, adopted by the river and harbor act of June 25, 1910, is to secure a channel 9 feet deep at mean low tide, 100 feet wide from the upper steamboat wharf at Calais to the public landing at St. Stephen, thence 150 feet wide to the lower steamboat wharf at Calais, and thence 12 feet deep and 200 feet wide to Hills Point, in accordance with report printed in House Document No. 748, Sixty-first Congress, second session. From Hills Point downstream there is sufficient width and depth. The estimated cost of this work is $234,000.

This project has not been modified since its adoption.

The first work under the present project was May 26, 1912, and up to the close of the fiscal year 29,057 cubic yards of material had been taken out. The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, is $3,994.47, all for new work. Sufficient work has not yet been done to afford any material advantage.

The mean tidal range is 19.9 feet.

The traffic by water during the calendar year 1911 was 122,535 short tons, largely lumber and coal, with an estimated total value amounting to $1,670,607. No effect on freight rates or movement is to be expected until the improvement is much further advanced.

The sum estimated for the fiscal year 1914 will be applied to continuation of the dredging. As all the business on the river is done at the head of navigation, the improvement must be practically completed to secure a material measure of benefit.

Amount (estimated) required to be appropriated for completion of existing project	$159,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	159,000.00

HARBOR AT BURLINGTON, VT.

The harbor of Burlington, Vt., is a half-moon-shaped bay on the eastern shore of Lake Champlain, about 41 miles from the foot of the lake. Before improvement there was ample depth of water along the docks and wharves, but they were without protection against wind and seas from Lake Champlain. In the greatest exposure during the prevalent northwesterly gales the wind has a sweep obliquely across the lake of about 10 nautical miles.

Burlington is a city of about 40,000 population, traversed by two railroads. Its harbor facilities can be extended as business requires, and on the opening of the new Champlain Canal this harbor should become a very important commercial factor.

The original project, adopted by the act of July 4, 1836, was to build a breakwater parallel with the shore and about 1,000 feet from the docks and wharves.

The existing project, adopted in 1886, is to extend the breakwater 1,500 feet (500 feet northerly and 1,000 feet southerly), at an estimated cost of $150,000, enlarged in 1894 and 1902 to embrace repairs and replacing the crib superstructure (3,833 feet) with one of stone or concrete, at a cost estimated at $173,750, a total of $323,750, increased in 1910 to $385,355.

On June 30, 1912, $240,573.86 had been expended on the project, of which amount $35,783.37 was for maintenance. There was received from sales $147.45.

About 68 per cent of the project has been completed. As the result of this expenditure 606 feet (364 feet northerly and 242 southerly) of the total extension of the breakwater has been completed, giving a total length of 4,157 feet of breakwater; 3,567 linear feet of the superstructure have been rebuilt and extensive repairs have been made to the substructure, the necessity for which repairs was not foreseen until the old superstructure was removed.

In its present condition the breakwater renders the commercial use of the harbor possible. No shoaling has taken place in the vicinity of the docks, the chief obstruction to navigation being in the form of a dilapidated submerged dike running out from shore toward the southerly end of the breakwater.

The tonnage of this harbor, mainly in miscellaneous merchandise, obtained from the best available information, is as follows:

	Short tons.
1904	107,421
1908	91,374
1909	78,935
1910	90,000
1911	100,000

The water-borne commerce of this port during gales is practically dependent for its existence upon the protection afforded by the breakwater.

The amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, is to be applied to work of maintenance.

Amount (estimated) required to be appropriated for completion of existing project	$123,323.37
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	2,000.00

NARROWS OF LAKE CHAMPLAIN, N. Y. AND VT.

The Narrows of Lake Champlain is that portion of the lake at its upper end included between Whitehall and Crown Point. The portion covered by the project for improvement is the southern 15 miles of the waterway from Whitehall to Benson Landing, Vt. In its original condition the channel was narrow and tortuous with a ruling depth of from 9½ to 10 feet at low lake level and a width probably between 75 and 200 feet.

From the foot of the canal to Whitehall to the head of Lake Champlain at Crown Point the navigable length of the Narrows is 37 miles. From Whitehall navigation is continued to the Hudson River and Erie Canal by the Champlain Canal, which is 61 miles long, from the southern extremity of the Narrows at Whitehall to Waterford, N. Y., making the Narrows a connecting link in an international highway for water-borne commerce between New York City and Canada.

Plattsburg Harbor, N. Y., is 87 miles by water, and Burlington, Vt., is 71 miles by water, north of Whitehall, N. Y. New York City is 214 miles south.

The existing project, adopted by the act of March 3, 1899, is to widen the channel and restore it to the depth of 12 feet at low lake level in five localities; also to provide fenders for protecting barges from collision with the rocky banks of the channel at Puts Rock, the Narrows, and Pulpit Point, at an estimated cost of $22,500. This project was completed, without modification, in 1905. Subsequent expenditures have been applied to maintenance of the improvement.

Under a contract for dredging in Whitehall Harbor, work had not been commenced at the close of the fiscal year. The expenditures during the year, amounting to $664.29, were in payment of the cost of a survey made preliminary to advertising for proposals for dredging, and in part payment of office expenses, advertising, printing, and contingencies.

On June 30, 1912, $25,503,96 had been expended on the existing project. The portion of this amount expended for maintenance is not definitely known, but is estimated at $3,003.96. There was received from sales $1.50.

The project has been completed. On June 30, 1912, the maximum available draft over the shoalest part of the locality under improvement is 10 feet at low lake level.

The improvements have been made in a section about 15 miles long. The head of navigation of the improved section is at Whitehall, N. Y. Navigation is, however, continued southward from Whitehall to the Erie Canal and the Hudson River via the Champlain Canal and northward to the St. Lawrence River via Lake Champlain, the Richelieu River, and Chambly Canal.

The commerce within the limits of the improvement, mainly in general merchandise, coal, pulp wood, and building material, as obtained from the best available information, is as follows:

Year.	Short tons.
1907	724, 529
1908	565, 414
1909	625, 604
1910	674, 683
1911	825, 975

The effect of the work done under the project has been to reduce the cost of operation to navigation companies, which has resulted in a reduction of freight rates and increased business. This waterway is an important factor in regulation of railroad rates. Rates unfavorable to water transportation are due to the small size of boats carrying freight through old canal and to poor terminal facilities at all lake ports. Both of these causes will be removed by State and municipal works nearing completion or contemplated.

The amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, is to be applied to maintenance of the improvement by dredging and repairs to fender booms.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$6, 000

HARBOR AT BOSTON, MASS.

The natural boundaries of Boston Harbor include all the expanse of tidewater lying within a line drawn from Point Allerton to Point Shirley, and extending from that line westward to the shores of the mainland. This comprises a surface area of about 30,000 acres, exclusive of the islands.

In its original condition the headlands and islands were without protection against the sea, which was extensively eroding them. Dangerous rocks obstructed the approach and entrance from Nantasket Roads to the lower main ship channel through the Narrows. That channel was 23 feet deep at mean low water, with a least width of 150 feet. The upper main ship channel from President Roads to Boston had a least depth of 18 feet at mean low water, with a least width of 100 feet. The channel from President Roads to Broad Sound in the ocean had a least depth of 29 feet at mean low water, with a least width of 200 feet.

The original project, adopted by the act of March 2, 1825, was "for the preservation of the islands in Boston Harbor, necessary to the security of that place," and until 1866 all expenditures, amounting to $546,526.10, appear to have been applied to that purpose in the building and repair of sea walls. The amount expended upon them since 1866 can not be accurately stated.

The project for the improvement of the harbor adopted by the act of March 2, 1867, was (as modified) to make the main ship channel from Nantasket Roads to Boston 23 feet deep at mean low water, 600 feet wide through the Narrows to President Roads, and 1,000 feet wide from President Roads to Boston.

To this project of improvement were added, from time to time, minor channels within or tributary to the harbor, since completed with allotments from the appropriation for Boston Harbor, known as Nantasket Beach Channel, Nix Mate Channel, Jeffries Point Channel, Chelsea Creek, Charles River, and Fort Point Channel.

Under the original project for sea walls and supplemental projects for the channels above named there has been expended for improvement and maintenance to June 30, 1912, $2,812,227.38, exclusive of all expenditures upon the three existing projects (27-foot, 30-foot, and 35-foot channels), with which expenditure about 3.75 miles of sea walls have been built and maintained, protecting the most exposed headlands and islands, the subordinate channels described in the preceding paragraph (except Charles River) have been completed, and a channel was obtained 23 feet deep at mean low water from Nantasket Roads to Boston, with a least width of 625 feet in the Narrows and 850 feet between President Roads and the city. From sales of property $265.46 has been derived.

The existing projects (other than for maintenance of the sea walls and the minor channels described above) are for improvement of the main channels, viz:

1. Adopted by the river and harbor act of July 13, 1892: To widen the main ship channel from Nantasket Roads to Boston, 8½ miles, to 1,000 feet, and to deepen it to 27 feet at mean low water, at an estimated cost of $1,250,000, subsequently increased to $1,488,751. Project completed.

2. Adopted by the river and harbor act of March 3, 1899 (H. Doc. No. 133, 55th Cong., 2d sess.): To widen the Broad Sound Channel, 2 miles long from President Roads to the sea, to 1,200 feet, and to deepen it to 30 feet at mean low water, at an estimated cost of $455,000. Project completed.

3. Adopted by the river and harbor act of June 13, 1902 (H. Doc. No. 119, 56th Cong., 2d sess.): To provide channels 35 feet deep at mean low water, 1,200 feet wide from the navy yard at Charlestown and the Chelsea Bridge and Charles River Bridge to President Roads, 6 miles, and 1,500 feet wide from President Roads through Broad Sound to the ocean, 1½ miles, at an estimated cost of $7,994,000 in round numbers. This estimate differs from any made in the project quoted in the act as the basis of the appropriation, owing to the different widths of the channels adopted. (To avoid a large amount of rock excavation the 35-foot channel from President Roads to Broad Sound is in a different location from the 30-foot channel.) No modification has been made in any of the foregoing projects since their adoption.

The river and harbor act approved July 25, 1912, adopted a new project, as recommended in House Document No. 272, Sixty-second Congress, second session, for improvement of Chelsea Creek between the Meridian Street Bridge and the old East Boston Bridge, by providing a channel 150 feet wide and 25 feet deep at mean low water, at an estimated cost of $85,000; subject to the condition, however, that the 24-inch water main of the Metropolitan Water System, which crosses the stream about 800 feet above the Meridian Street Bridge, is lowered without expense to the United States. The act made an appropriation of $85,000 for this work.

In the river and harbor act approved July 25, 1912, provision was made for an examination and survey to provide a deeper channel from President Roads to the ocean. The Finns Ledge survey, as partly completed, indicates that any such deeper channel must be located to the eastward of that ledge, as its area below the 35 feet projected in the existing project is too great to allow its removal to 40 feet for any reasonable sum. Without blasting, Finns Ledge would afford an excellent foundation for a lighthouse, which, with the Graves Lighthouse, would make the Boston entrance one of the best marked on the Atlantic coast. This possible modification of project will be discussed in detail in the report on the preliminary examination and survey called for by the act approved July 25, 1912.

Under the project of July 13, 1892, for 27-foot channel, the amount expended to June 30, 1912, was $1,474,106.29, of which $59,715.30 was for maintenance ($10 was derived from sales).

Under the project of March 3, 1899, for 30-foot channel, to June 30, 1912, the amount expended was $455,000; $385,200 for improvement, and $69,800 for maintenance.

To June 30, 1912, the amount expended on the 35-foot channel, not including outstanding liabilities, was $6,252,531.04 ($122.71 was derived from sales), all for improvement.

With the total amount expended under the 27-foot project the upper and lower main ship channels from Boston to President Roads and from President Roads to the sea have been dredged to the width of 1,000 feet and depth of 27 feet at mean low water.

A survey of the improved channel in 1911 shows that no material deterioration has occurred. The maximum draft that can be carried at mean low water, June 30, 1912, over the shoalest part is 27 feet.

Under the 30-foot project, a channel has been obtained 1,200 feet wide and 30 feet deep at mean low water from President Roads to Broad Sound.

A survey of the improved channel in 1911 shows that no material deterioration has occurred. The maximum draft that can be carried at mean low water, June 30, 1912, over the shoalest part is 30 feet.

Under the 35-foot project of June 13, 1902, a channel of the full projected depth and width from the navy yard, Charles River Bridge, and Chelsea Bridge to President Roads, and from President Roads through Broad Sound to the ocean has been dredged, but the channel is still obstructed by ledges.

The work accomplished to the end of the fiscal year in the upper main ship channel was the dredging of 16,647,702.5 cubic yards of mud, sand, gravel, and clay, 23.642 cubic yards of bowlders, and the excavation of 30,397 cubic yards of ledge; and in Broad Sound Channel the dredging of 4,727,102 cubic yards of mud, sand, gravel, clay, hardpan, and cobblestones, and 349.993 cubic yards of bowlders. The total amount of material dredged is 21,375,178.135 cubic yards, and of rock excavated is 30,397 cubic yards, which completes all the dredging and 25 per cent of all the rock excavation required under the project. The yardage expressed refers to scow measurement except for rock excavation, which is place measurement.

The mean range of tide is 9.5 feet at Boston Light and 9.6 feet in the upper harbor.

The foreign exports and imports for the port of Boston during the calendar year ending December 31, 1911, amounted in value to $189,575,378, being an increase of $122,888,857 over the valuation in 1867, when the systematic improvement of the channels was begun.

As to the effect of the improvement on freight lines, the general manager of the principal foreign steamship lines entering this port states that about 30 years ago steamers were employed with a loaded draft of 20 to 24 feet; 22 or 23 years ago, of 25 to 26 feet; 14 years ago, 27 or 28 feet; 10 years ago, 28 feet 9 inches; later, 31 feet; and recently one of 33 feet 10½ inches. He states, generally—

> that freight rates, caused by the larger class of steamers being used, are about 50 per cent less than they were some 15 or 20 years ago, when very much smaller steamers were engaged in the trade.

The appropriation recommended for general improvement will be applied to necessary repairs to sea walls and maintenance of improvements heretofore made in the tributary channels of the harbor.

Fort Point Channel.—This channel is situated between the eastern shore of Boston proper on the one side and the reclaimed and improved South Boston flats on the other side; is about 1¼ miles in length and connects the tidal basin of the South Bay, which covers an area of about 250 acres, with Boston upper harbor. In its original condition the mid-channel depth was 12 feet at its mouth and 16 feet thence to the Federal Street Bridge, excepting at the draw in the Congress Street Bridge, where it was 14.5 feet at mean low water.

The original project, adopted by the act of August 5, 1886 (H. Ex. Doc. No. 206, 48th Cong., 2d sess.), which is also the existing project, is to dredge a channel 175 feet wide and 23 feet deep at mean low water from the entrance, about 4,190 feet, to near Federal Street Bridge, at an estimated cost of $100,000, reduced in 1887 to $78,750. No modification has been made in the existing project since its adoption.

No work was done and none required in maintenance of improvement during the fiscal year.

The total cost to the United States to June 30, 1912, was $75,606.23, including $9,219.10 for maintenance.

The improvement was completed in 1909.

The maximum draft that can be carried, June 30, 1912, at mean low water over the shoalest part of the improved channel is 23 feet. The mean range of tide is 9.6 feet.

The head of navigation is the southern extremity of South Bay, at Massachusetts Avenue, Boston, Mass., to which point, about 2 miles from the entrance to the channel in Boston Harbor, the channel is navigable in fact.

The commerce benefited by this improvement consists of coal, sugar, building materials, and miscellaneous merchandise, which amounted in the calendar year 1910 to 1,423,456 short tons, and in 1911 to 1,507,621 short tons, valued at over $16,000,000.

PROJECT FOR GENERAL IMPROVEMENT.

July 1, 1911, balance unexpended		$48,349.51
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$882.96	
For maintenance of improvement	38,697.18	
		39,580.14
July 1, 1912, balance unexpended		8,769.37
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement		25,000.00

PROJECT OF 1892 FOR 27-FOOT CHANNEL.

July 1, 1911, balance unexpended	$32,668.00
June 30, 1912, amount expended during fiscal year for maintenance of improvement	1,168.00
July 1, 1912, balance unexpended	31,500.00

PROJECT OF 1899 FOR 30-FOOT CHANNEL THROUGH BROAD SOUND.

July 1, 1911, balance unexpended	$69,800.00
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	69,800.00

CHELSEA CREEK (BOSTON HARBOR) PROJECT.

Amount appropriated by river and harbor act approved July 25, 1912	$85,000.00
Amount available for fiscal year 1913	85,000.00

PROJECT OF 1902 FOR 35-FOOT CHANNEL.

July 1, 1911, balance unexpended	$1,186,783.31
Receipts from sales	46.52
	1,186,829.83
June 30, 1912, amount expended during fiscal year, for works of improvement	339,238.16
Amount (estimated) required to be appropriated for completion of existing project	869,000.00

HARBOR OF REFUGE AT HYANNIS, MASS.

The harbor of Hyannis lies on the south shore of the peninsula of Cape Cod and about 15 miles to the westward of the heel of the cape, and is an important harbor of refuge for the smaller class of vessels passing through Nantucket Sound.

This harbor, before improvement, was an open roadstead, exposed to southerly storms. About 8 feet at mean low water could be carried to the site of the present wharf of the New York, New Haven & Hartford Railroad Co.

In the years 1827–1838 a breakwater 1,170 feet long was constructed of riprap granite, covering an anchorage of about 175 acres, the entrance to which has a depth of about 15.5 feet. The harbor is about 20 miles east-northeast from Vineyard Haven on the island of Marthas Vineyard, Mass., and about 85 miles from the harbor of Provincetown, at the northern extremity of Cape Cod, which is the first sheltered harbor to be encountered after leaving Hyannis in rounding the cape.

Between the years 1852 and 1882, extensive repairs were made, increasing the width of the base of the breakwater and the size of the stone forming its sides and top.

The sum of $123,431.82 had been expended at this harbor prior to operations under existing project.

The existing project, that of August 5, 1886, House Document No. 96, Forty-eighth Congress, second session, with map, also printed at page 619, Annual Report of the Chief of Engineers for 1885, with maps at page 560 of same report, provided for dredging to 15.5 feet at low water about 36 acres area north of the existing breakwater so as to increase the deep-water anchorage by that amount, all at a total estimated cost at that time of $45,743.20, increased $30,568.94 in accordance with the report of November 27, 1899, printed in House Document No. 79, Fifty-sixth Congress, first session; also printed without map on page 1284, Annual Report of the Chief of Engineers for 1900, and adopted by the river and harbor act of June 13, 1902; making the total estimated cost $76,312.14. The only change by this modification was in the estimated cost of the work.

The project under which the work has been conducted and which has now been completed provided for deepening to 15.5 feet at mean low water an area of about 36 acres north of the existing breakwater to increase the deep-water anchorage by that amount.

At the adoption of this project the 15.5-foot depth anchorage covered only about 47 acres, and the 36 additional acres to be dredged carried a depth of from 7 to 15.5 feet of water at low water.

The total amount expended on this project to June 30, 1912, was $74,112.19, of which $161.43 was applied to maintenance. Under the 1884 project the 36 additional acres had been dredged to 15.5 feet at mean low water, and two cuts, each 25 feet wide and 13 feet deep at mean low water, had been dredged in the channel leading to the wharf of the New York, New Haven & Hartford Railroad Co., completing the project. No work was done during the fiscal year ending June 30, 1912.

The amount expended during the fiscal year 1912 was for liabilities incurred in making examination of the harbor. Some deterioration has taken place in the depth, and it is estimated that it will cost $24,000 for its restoration. The shoalest portion of the improvement is in the extreme northwesterly corner, where the depth is 9.6 feet at mean low tide. The greater portion of the area dredged maintains its depth.

The mean rise and fall of the tide is about 3 feet.

The principal value of this harbor to commerce is as a harbor of refuge for coasters and fishing vessels. The actual commerce of the place is, in general, lumber and other building materials, coal, and fish, aggregating in the last calendar year 2,434 short tons, valued at $229,400. So far as known, the improvement has had no effect on freight rates.

It is proposed to expend the amount estimated as a profitable expenditure for the fiscal year ending June 30, 1914, in restoring the depth of 15.5 feet at the points where shoaling has occurred.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	**$24,000**

HARBOR AT LYNN, MASS.

Lynn Harbor is distant about 14 miles by water in a northeast direction from Boston Harbor. Is about 3 miles in extent from north to south and has an average width east and west of about 1½ miles, the greater part being bare at low water.

In its original condition three narrow and crooked channels, in which the depth was but 6 feet at mean low water, extended from the wharves to the sea.

The original project, defined in the report of a board of engineers dated April 10, 1884, and as modified in 1888, was to dredge a channel 200 feet wide and 10 feet deep at mean low water from the sea (at White Rocks), a distance of 3,300 feet, to a deep basin opposite Little Nahant, and from the basin nearly opposite Sand Point, a distance of 6,900 feet to a point 400 feet inside the harbor line, and an anchorage basin 500 feet by 300 feet and 10 feet deep at mean low water; the upper part of the channel to be maintained by occasional dredging, the lower part by a training wall joining the land at Little Nahant, at an estimated cost of $182,000.

The amount expended on this project was $122,063.56, all for improvement, with which the entire channel and the anchorage basin as prescribed in the project were completed.

The project adopted by the river and harbor act of June 13, 1902, was to dredge a channel 200 feet wide, 4,500 feet long, from the sea to the deep basin opposite Little Nahant; from the basin nearly opposite Sand Point, a distance of 7,000 feet, to the anchorage basin, and the anchorage basin itself, 500 feet by 300 feet, all to the depth of 15 feet at mean low water, at an estimated cost of $162,937. The projected channel and basin were completed in May, 1908. Under the project to the close of the fiscal year ending June 30, 1912, $166,373.44 was expended; $164,373.44 being for improvement and $2,000 (in the fiscal years 1911 and 1912) for maintenance.

The existing project was adopted by the river and harbor act of June 25, 1910 (H. Doc. No. 948, 60th Cong., 1st sess.), and provides for the widening, to the same depth, and straightening the present channel and turning basin so as to make the former 300 feet wide and the latter 500 feet square, at a total estimated cost of $179,000. No modification has been made in the existing project since its adoption.

During the fiscal year $9,086.29 was expended (for improvement) in completing the removal of a shoal about 4,500 feet long along the western side of the inner channel, and $983.93 was expended for maintenance in restoring the 200-foot channel adjacent to that shoal to the depth of 15 feet.

The total amount expended under the existing project to June 30, 1912, was $55,500, all for improvement.

The project is about 37 per cent completed. A shoal along the western side of the inner channel, 4,500 feet long and about 100 feet wide, has been removed to the depth of 15 feet at mean low water, a total of 231,265 cubic yards having been dredged and paid for.

The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement is 15 feet at mean low water. The mean range of tide is 9.3 feet.

The commerce of the harbor benefited by the improvement consists chiefly of coal, lumber, and building materials, and amounted in 1910 to 433,808 short tons and in 1911 to 478,574 short tons, valued at about $1,800,000. The deepening of the channel to 15 feet enables the smaller or medium-sized barges to carry full cargoes of coal to the wharves at all stages of the tide and barges of the greatest draft during the higher stages.

It is reported by local commercial interests that the cost of transportation was reduced 25 cents a ton by deepening the channel to 10 feet and further diminished by increasing the depth to 15 feet.

The appropriation recommended will be applied to completion of the existing project.

Under a provision in the river and harbor act of July 13, 1892, $5,000 of the appropriation for Lynn Harbor was expended on the western (or Saugus River) channel in Lynn Harbor in obtaining a channel 8 feet deep at mean low water and 150 feet wide for an aggregate length of 2,200 feet. This channel has since deteriorated and for making a survey and restoring the channel to its former dimensions $5,000 was allotted on June 25, 1912, from the appropriation provided by the river and harbor act of March 2, 1907, for emergencies in rivers and harbors. At the close of the year work had not been commenced.

Amount (estimated) required to be appropriated for completion of existing project	$84.000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	84,000

HARBOR OF REFUGE AT NANTUCKET, MASS.

This harbor is the only one between the harbors of Marthas Vineyard (Vineyard Haven and Edgartown) and Provincetown, a distance of 100 miles, except the small harbor of Hyannis on the north side of Nantucket Sound. It has a total area, below "First Point" on Coatue Beach, of about 502 acres, of which 102 acres has a depth of water in excess of 12 feet, and the object of the improvement is to make it a harbor of refuge for vessels plying between ports north and south of Cape Cod. Incidentally, it forms a commercial harbor for the island of Nantucket, and it is the only one on the island. So far as known, it has never been used to any great extent as a harbor of refuge. It is 32 miles from the harbor of Vineyard Haven on the island of Marthas Vineyard, Mass., and 80 miles from the harbor of Provincetown at the northern extremity of Cape Cod, which is the first sheltered harbor to be encountered in rounding the cape.

In its original condition the channel entrance was obstructed by a bar 1.5 miles in width, on which there was only 6 feet of water at mean low tide, the channel being very crooked and subject to changes in location.

Between 1829 and 1844 an ineffectual attempt was made to dredge a channel through the bar; and $45,734.75 was expended prior to beginning operations under the existing project.

The existing project, adopted June 14, 1880 (House Doc. No. 18, 46th Cong., 2d sess.; p. 423, Annual Report of Chief of Engineers for 1880, Part I), and modified July 21, 1885 (p. 564, Annual Report of the Chief of Engineers for 1885), provides for the construction of two converging jetties on either side of the entrance to the harbor and for dredging when necessary in order to obtain a channel depth of from 12 to 15 feet at mean low water. Estimated cost, $375,000, exclusive of cost of dredging. In 1905 a further modification of the project was made by adding $100,000 for dredging to the original estimated cost of the project, making the total estimated cost $475,000.

The actual project under which work is at present conducted provides for securing a channel depth of 12 to 15 feet at mean low water from Nantucket Sound into the harbor, that depth to be secured and maintained by means of converging jetties and by dredging between them.

The operations during the fiscal year were for maintenance, and consisted in deepening the channel by dredging to a depth of 15 feet and a width of approximately 200 feet, the central portion of which had a depth of 17 feet at mean low water for a width of 100 feet.

The amount expended during the fiscal year was $62,089.84.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, exclusive of outstanding liabilities, was $471,793.05, of which $112,089.84 was expended in dredging and $55,511.90 for maintenance. Of the maintenance expenditures, $7,210 was used on the west jetty, $6,312.90 on the east jetty, and $71,908 on dredging.

In the original project for this work the height of the jetties above mean low water was left to be determined by experience, and it will be some years before the work can be considered as completed. Up to the close of the fiscal year ending June 30, 1912, the eastern jetty had been built to its full length, but only of partial cross section; the west jetty had been built out 83 per cent of its total projected length. A channel had been dredged of the above dimensions with a depth on the outer bar of from 17 to 20 feet, which in nine months since the work was done has shoaled to from 15 to 18 feet. The shoalest part of the locality under improvement is 12.8 feet at mean low tide, although there is an available channel of 15 feet depth, with a minimum width of 100 feet. The mean rise and fall of the tide is 3 feet. The length of the channel between the inside and outside 12-foot contours is 1.32 miles.

The entire commerce of the island of Nantucket is carried on at this harbor, and amounted in the year 1911 to about 36,630 short tons, valued at $1,283,173, consisting mainly of general merchandise, building material, coal, forage, grain, live stock, fish, and shellfish. The harbor was also used to a small extent as a harbor of refuge for small fishing vessels and yachts. So far as known, the project has had no effect on freight rates.

It is proposed to apply the available funds and those asked for toward enlarging and maintaining the channel by dredging or to such work on the jetties as may be desirable.

Amount (estimated) required to be appropriated for completion of existing project	$51,312
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	51,312

CONSOLIDATED.

Amount (estimated) required to be appropriated for completion of existing project	$51,312
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	75,312

NEWBURYPORT HARBOR, MASS.

The water front of Newburyport is on the Merrimac River, about 2½ miles above the mouth and about 58 miles by water north of Boston. The river at this point is about one-fourth of a mile wide.

Prior to specific appropriations for Newburyport Harbor funds applicable to Merrimac River, of which it is the estuary, were devoted to removing a sand bar and constructing a breakwater at the river's mouth, 1828 to 1836, and to removing obstructing ledges, piers, and wrecks, 1870 to 1880. In its original condition the outlet of the Merrimac River, which, between Plum Island and Salisbury Point, was 1,000 feet wide and 30 feet deep at mean low water, was obstructed by a sand bar, nearly a mile outside, through which, in 1880, a narrow channel about 7 feet deep at mean low water was maintained by the current of the river.

The original project adopted by the act of June 14, 1880, which is the existing project, is published in the Annual Report of the Chief of Engineers for 1881, page 502, and is to create at the outer bar a permanent channel 1,000 feet wide, and at least 17 feet deep at mean low water, by constructing two converging jetties, projecting, one from the north shore 2,910 feet, the other from the south shore 1,500 feet (reduced in 1883, in changing its direction, to 1,320 feet), their outer ends 1,000 feet apart, which, with the protection of the beach in their vicinity, was estimated in 1881 to cost $365,000. The direction of jetties and shore protection was modified in 1883, and in 1882 the partial closing of Plum Island Basin with a timber dike about 800 feet long and 5½ feet above mean low water was added to the project, increasing the cost (as estimated in 1884) to $375,000. In 1884 a modification of the project provided for extending both jetties 610 feet parallel to the axis of the channel, and in 1886 for increasing the extension to 1,000 feet, increasing the cost of the work, as estimated in 1897, to $599,547.49.

The modification of 1884 changed the direction of both the north and south jetties from straight jetties ending in circular mounds to bent jetties. In each jetty the change of direction was made on a gradual curve, the jetties converging until their center lines were 1,000 feet apart, and then extending parallel for a distance of 1,000 feet (as expressed in 1886). The 1,000-foot parallel extension of the jetties being thus estimated from a point where convergence ceases instead of from the center of the mounds at the outer ends of the jetties, as formerly proposed, the total lengths of the jetties as now projected are respectively 4,118 feet for the north jetty and 2,445 feet for the south jetty.

The river and harbor act of June 25, 1910, authorized dredging to be included as a part of the existing project.

The existing project, as modified from time to time, is to create a permanent channel through the outer bar 1,000 feet wide and at least 17 feet deep at mean low water by constructing two jetties, projecting, one from the north shore and the other from the south shore, converging until 1,000 feet apart, and then extending seaward parallel to the axis of the channel for a distance of 1,000 feet; total length of north jetty, 4,118 feet; of south jetty, 2,445 feet; and the partial closing of Plum Island Basin by a timber dike. Dredging through the bar, if found necessary, is also included in the project.

To June 30, 1912, the amount expended on this project was $440,688.88, of which $10,389.68 was for maintenance. In addition, $500 was expended in 1901 for removal of North Rock under authority of act of March 3, 1899. By way of refundment, $795.31 was recovered from a failing contractor.

The project is about 85 per cent completed. The north jetty has been completed to its full cross section for a length of 2,868 feet, and a core 12 feet above mean low water, with a width of 5 feet on top, has been built for a further distance of 1,250 feet to its outer end. The south jetty has been completed, except for a distance of 30 feet at its outer end; the Plum Island Basin has been closed with a timber dike 817 feet long, 5½ feet high above mean low water, except near the middle, where a weir 150 feet long and 2 feet above mean low water was left temporarily, and two sand catchers, respectively 480 and 572 feet in length, have been built in rear of the south jetty.

Both jetties, so far as completed, are 15 feet wide on top, which is in a plane 12 feet above mean low water, and have slopes of 1 on 2 on the seaward face and 1 on 1 on the shoreward face.

June 30, 1912, the maximum draft that can be carried over the bar at mean low water is 11 feet. The mean range of tide is 7.7 feet.

The commerce of the harbor, chiefly coal, amounted in 1910 to 181,401 short tons, and in 1911 to 217,301 short tons, valued at $863,099.50. Of the latter amount, 108,686 tons were reshipped to points on the Merrimac and Powow Rivers.

It is reported that the improvement made has reduced freight rates 25 cents per ton, and that if the projected depth of 17 feet at mean low water be obtained over the outer bar it would still further reduce the freight rates 15 to 25 cents per ton.

The appropriation recommended will be applied to continuing improvement by increasing the cross section of the core of the north jetty.

Amount (estimated) required to be appropriated for completion of existing project	$159,369.28
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	25,000.00

POLLOCK RIP CHANNEL, ENTRANCE TO NANTUCKET SOUND, MASS.

No improvement of this locality has been made. At present the northerly passage over the shoals near the eastern entrance to Nantucket Sound, known as the Monomoy Shoal, is very crooked and in places narrow. It is subject to very strong tides and directly exposed to the full force of the easterly storms of the ocean. This passage is about 12½ miles in length, measured from the Handkerchief Light Vessel to the whistling buoy north of Pollock Rip Slue, and, with a 21-foot depth, varies in width from about 2,000 to 3,600 feet with a width of many miles as the Handkerchief Light Vessel is approached. The limiting depth in the passage over the shoals is about 27 feet. The locality is about 26 miles to the eastward of Vineyard Haven Harbor and about 60 miles to the southward of Provincetown, at the northern extremity of Cape Cod.

The existing project, adopted by the river and harbor act of July 25, 1912, provides for the improvement of the north, or Pollock Rip, Channel through the shoals lying near the entrance to Nantucket

Sound by dredging to a depth of 30 feet at mean low water, using for the purpose an available Government-owned plant, under appropriations aggregating $250,000, to make a more definite determination as to what amount of additional work of improvement is advisable. The reports on the preliminary examination and survey of this locality are printed in House Document No. 536, Sixty-second Congress, second session.

No modifications have been made in the existing project since its adoption.

Operations have not commenced under the project.

No funds have been expended.

The work will be done by hired labor and use of Government plant.

It is estimated that a commerce of over 20,000,000 tons annually will be benefited greatly if it be practicable to construct and maintain the proposed channel.

It is proposed to apply the funds estimated as a profitable expenditure for the fiscal year ending June 30, 1914, to continuing the excavation of the proposed straight channel, which it is expected will make a portion of the improvement available.

Amount appropriated by river and harbor act approved July 25, 1912......	$125,000
Amount available for the fiscal year ending June 30, 1913................	125,000
Amount (estimated) required to be appropriated for completion of existing project..	125,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement..	125,000

MERRIMAC RIVER, MASS.

The Merrimac River is formed by the confluence of the Pemigewasset and Winnepesaukee Rivers at Franklin, N. H. It flows southerly through the State of New Hampshire, enters the State of Massachusetts above Lowell, whence it flows in an easterly direction, and discharges into the Atlantic Ocean at Newburyport, Mass., about 55 miles by water north of Boston. Its total length is about 110 miles. Only that section of the river between Newburyport (about 2½ miles above the mouth) and Haverhill, Mass., covering a distance of 16½ miles, is included in the project.

In its original condition the river had a practicable channel 7 feet deep at mean low water from its mouth 9 miles to South Amesbury, but besides being narrow and crooked the channel was obstructed by ledges, bowlders, and shoals.

The original projects appear to have been—

(1) For improving the bar at the mouth of the river by erection of piers or other works, adopted by act of May 23, 1828; subsequently improved under separate project for "Improving harbor at Newburyport, Mass."

(2) For the improvement of the river above the mouth by the removal of the remains of a dam at the upper falls and of a rock at the lower falls, of Gangway Rock in Newburyport Harbor, and a wreck near the mouth of the river.

Upon the original and modified projects, prior to operations under the existing project, there was expended: Upon the project of 1828, $67,466.72, and upon the project of 1870, as extended by the acts of June 23, 1874, and June 3, 1896, which appropriated $5,000 for removal of "certain rocks below Rocks Bridge," $187,000; total, $254,466.72.

The existing project, adopted by the act of March 3, 1899 (H. Doc. No. 52, 55th Cong., 1st sess.), is to obtain a channel 7 feet deep at mean low water, 150 feet wide, from Newburyport, 16½ miles, to Haverhill, at an estimated cost of $171,442.70. No modification has been made in this project since its adoption.

During the working season of 1911 the channel was redredged to the projected width and depth from Haverhill downstream nearly through Curriers Shoal, 19,232.361 cubic yards (including 410 cubic yards in previous fiscal year) being removed, at an expenditure of $13,902.16, all for maintenance. No work was done during the working season of 1912. Redredging is necessary from the lower end of Curriers Shoal to just below Rocks Bridge, but the small balance of funds remaining is not sufficient to complete the work.

The amount expended on the existing project to June 30, 1912, was $138,500.10, of which $23,075.33 was applied to maintenance of improvement. From sales $2.08 was derived.

The channel was completed to the full projected depth and width in December, 1907, since which time it has been maintained by redredging and removal of bowlders.

June 30, 1912, the maximum draft that can be carried at mean low water over the shoalest part of the improved channel is 7 feet.

The mean range of tide is, at the mouth of the river, 7.7 feet, and at Haverhill Bridge 4.6 feet, at low-water stage of the river.

The head of navigation is at the hat factory, one-half mile above the railroad bridge at Haverhill, to which point the stream is navigable in fact, about 20 miles above its mouth, in Newburyport Harbor.

The commerce of the river is chiefly in coal distributed to the cities and towns along its banks, and amounted in 1910 to 102,178 short tons and in 1911 to 108,686 short tons, valued at $485,618.70. The improvement of the channel is reported to enable the delivery of coal by water at rates 35 to 50 cents per ton less than by rail.

The appropriation recommended will be applied to maintenance of the dredged channel.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement, ... $10,000

MYSTIC RIVER BELOW THE MOUTH OF ISLAND END RIVER.

Island End River is 1.6 miles above the mouth of the Mystic at the navy yard in Charlestown; and 2,700 feet above the Chelsea drawbridge over the Mystic.

In its original condition the Mystic up to Island End River had a narrow channel 14.4 feet deep at mean low water, but so narrow above the drawbridge as to be barely practicable.

The original project, adopted by the act of March 3, 1899, with estimate of cost, printed in House Document No. 178, Fifty-fifth Congress, third session, was to dredge a channel 25 feet deep at mean low water and 300 feet wide, embracing 1.7 miles of the Mystic extending from its mouth to a point 800 feet above Island End River, at a cost estimated in August, 1899, at $267,547.50 (reduced estimate).

This project was modified by the river and harbor act of June 25, 1910, in accordance with plan printed in House Document No. 1086, Sixtieth Congress, second session, by providing for the abandonment of the proposed extension above the mouth of Island End River.

The 25-foot project, as modified, was completed in February, 1911. The total expenditures to June 30, 1912, were $136,005.12 (all for improvement, except $10,281.92 for maintenance).

The existing project, adopted by the river and harbor act of June 25, 1910 (H. Doc. No. 1086, 60th Cong., 2d sess.), provides for a channel 30 feet deep from the mouth of Island End River to Chelsea Bridge, and through the draw to the 35-foot channel on the downstream side of the bridge; the channel has a width of 600 feet at the upstream end, gradually narrowing to 300 feet, and includes the widening of the entrance channel leading to Mystic Wharf, at an estimated cost of $172,000. No modification has been made in existing project since its adoption.

No work was done during the fiscal year. The expenditure, all for improvement, was $5,403.84 for final payment on contract completed during the previous fiscal year and $431.87 for engineering expenses and advertising in connection with a new contract entered into for dredging along the western edge of the channel just above Chelsea Bridge to make a direct straight connection (in conjunction with the dredging by the city of Boston through the draw spans of its new bridge) between the 35-foot channel below and the 30-foot channel above the bridge, already dredged by the United States.

Under the existing project to June 30, 1912, there was expended $63,830.92 (all for improvement). From sales, 45 cents was derived. The project is about 39 per cent completed.

A channel 300 feet wide and 30 feet deep has been dredged from Chelsea Bridge to just above the mouth of Island End River, except a section on the north side of the channel about 300 feet long and 35 feet wide just above the Chelsea Bridge pier, where ledge has been found above grade. The entrance to the channel leading to Mystic Wharf has also been enlarged by dredging to 30 feet depth.

The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement is at mean low water 30 feet. The mean range of tide is 9.6 feet.

The commerce of the river, which in 1901 amounted to 1,430,650 short tons, had increased to 3,715,805 short tons in 1908, and to 4,894,088 short tons in 1909. In 1910 the amount was 3,245,630 short tons, and, in 1911, 3,562,870 short tons, valued at more than $17,000,000.[1] About three-fourths of all the freight carried on the river is coal.

No material reduction in freight rates has been effected by the improvement, but it is of advantage to shipping interests in permitting utilization of larger vessels.

The appropriation recommended will be applied to completion of the project.

Amount (estimated) required to be appropriated for completion of existing project	$50,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	50,000

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[1] The statistics prior to 1910 include south channel of Mystic River and the portion of Mystic Wharf lying below Chelsea Bridge. These localities are omitted from the 1910 and 1911 statistics, as they are not influenced by this improvement.

PROVIDENCE RIVER AND HARBOR AND NARRAGANSETT BAY, AND GREEN JACKET SHOAL, R. I.

(*a*) *Providence River and Harbor and Narragansett Bay.*—The object of this improvement is to furnish a wide and deep channel for foreign and coastwise commerce from the ocean to Providence and to provide a deep-water anchorage for that harbor.

Before the improvement of the river in 1853 the available low-water depth was limited to 4.5 feet.

The Providence River is formed by the union of the Seekonk, or Pawtucket River, with several smaller streams at Providence. It is a tidal river and extends southerly for about 8 miles to Conimicut Point, where it widens into Narragansett Bay.

Between 1852 and 1873, $59,000 was expended in securing first 9 feet and then 12 feet depth of channel.

The approved project of 1878, as modified in 1882, provided for deepening the river and deepening and widening its anchorage basins so as to secure a channel of at least 25 feet depth at low water with 300 feet width from the deep water of Narragansett Bay up to Providence, R. I., and so as to secure anchorage basins of 20 feet depth with 600 feet width, 18 feet depth with 725 feet width, 12 feet depth with 940 feet width, and 6 feet depth with 1,060 feet width from Fox Point to Fields Point, all at a total cost estimated in 1882 at $675,000. This project was completed in 1895.

Another project originating in the river and harbor act of June 3, 1896, provided for securing a ship canal 400 feet wide and of a depth of 25 feet at mean low water from Sassafras Point, in Providence Harbor, through Providence River and Narragansett Bay by the most direct route practicable to the ocean by way of the "Western Passage," so called, at an estimated cost of $732,820. This project was put under the continuing-contract system, and the amount expended on the work up to the close of the fiscal year ending June 30, 1908, exclusive of outstanding liabilities, was $476,210.28, by wihch the channel 400 feet wide and 25 feet deep has been completed from Sassafras Point to the deep water of Narragansett Bay by the Western Passage.

Under date of June 11, 1904, the Chief of Engineers authorized the use of $2,000 of the balance remaining on hand of the appropriation for securing a channel through the Western Passage of Narragansett Bay for the removal of certain obstructing rocks in Dutch Island Harbor, R. I.

Another project adopted by the river and harbor act of June 13, 1902, provided for an enlarged anchorage area of 25 feet depth, extending the full width of the harbor from Fox Point on the north to Long Bed and Sassafras Point on the south, including the area known as Green Jacket Shoal, but excluding a small area adjacent to the western harbor line between Harbor Junction pier and Sassafras Point, at an estimated cost of $607,778. This project was enlarged by the river and harbor act of March 2, 1907, so as to include an area of uniform width and 25 feet depth to the eastward of the main ship channel, between Long Bed and Kettle Point, for which $90,750 was appropriated, making the total estimated cost $698,528. The total amount expended on projects previous to the existing one was $1,859,480.35.

The existing projects, adopted by the river and harbor act of June 25, 1910, are two in number, one in accordance with report printed in House Document No. 919, Sixtieth Congress, first session, providing for the removal to a depth of 25 feet of a triangular shoal area in the southeastern part of the harbor, just north of Kettle Point, limited on the east by the harbor line and on the north and west by the areas already dredged, at an estimated cost of $184 800; and the other in accordance with report printed in House Document No. 606 Sixty-first Congress, second session, providing for extending the 25-foot deep anchorage area to the western harbor line from just above Harbor Junction pier to Fields Point and widening the present 400-foot channel between Kettle Point and Gaspee Point to 600 feet, with certain easement of bends, at an estimated cost of $459 000. The act contains a provision that no part of this latter amount shall be expended until the Secretary of War shall have received satisfactory assurances that the city of Providence or other local agency will expend on the improvement of the harbor front an equal sum.

The project under which work is now in progress with all modifications, provides for dredging all of the harbor between Fox Point and Fields Point, limited on the east and west by the harbor lines, the cutting off of Fields Point back to the western harbor line and widening the approach channel to a minimum width of 600 feet from Kettle Point to Gaspee Point; also restoring the depths in certain of the older portions of the work that have shoaled since originally dredged. The depth required for all work is 25 feet at mean low water.

During the past fiscal year a portion of the triangular shoal area in the southeast part of the harbor was removed, and the 25-foot depth available in the harbor was thereby widened about 250 feet. (H. Doc. No. 919, 60th Cong., 1st sess.) The widening of the approach channel between Kettle Point and Gaspee Point had been very nearly completed, there remaining only the cleaning up of certain shoals left in the first dredging to complete that portion of the work. The work of widening the harbor to the western harbor line is well under way. (H. Doc. No. 606, 61st Cong., 2d sess.) The State wharf on the west side of the harbor and the city quay wall between Sassafras Point and Fields Point, the assurances for the construction of which were given the Secretary of War in conformity with the requirements of the act adopting the project, are both under construction. The operations during the year were all for new work. The expenditures during the year amounted to $232,418.79, exclusive of outstanding liabilities.

The amount expended under the existing project up to June 30, 1912, exclusive of outstanding liabilities, was $294,494.81.

The work of widening the approach channel between Kettle Point and Gaspee Point and the widening of the harbor to the western harbor line from the vicinity of Harbor Junction Pier to Fields Point, both under the project described in House Document No. 606, Sixty-first Congress, second session, are in progress under continuing-contract appropriations, for which $429,000 has been appropriated and $30,000 remains to be appropriated.

About 58 per cent of the new work contemplated is completed. The approach channel has been widened from 400 feet to 600 feet, and while the additional width has not the full depth of 25 feet at all points, it is of great convenience to passing vessels, and the additional width given in the harbor affords relief to the often congested condition of the anchorage. The minimum draft on any of the improved portion is 18 feet, while portions of Fields Point which have not as yet been dredged are from 6 to 35 feet above the plane of mean low water. The length of the improved section of the river and harbor between Fox Point and Gaspee Point is 5¼ miles.

The mean rise and fall of the tide is 4.7 feet.

The commerce of Providence Harbor, including 508,625 short tons entering and leaving Pawtucket River, was 3,887,858 short tons, valued at $103,313,720.63, consisting chiefly of coal, oils, chemicals, general merchandise, fish, and shellfish.

So far as known, the works of improvement have had no effect upon freight rates.

It is proposed to apply the funds asked for to the completion of the project for removing the triangular shoal in the southeastern part of the harbor and the project for widening and straightening the approach channel between Kettle Point and Gaspee Point, and widening the harbor to the western harbor line at and above Fields Point. Both projects adopted by the river and harbor act of June 25, 1910.

(*b*) *Green Jacket Shoal.*—This shoal was in that part of Providence River which constitutes the harbor of Providence. It lay off the wharves on the south front of the city and occupied a part of the harbor that is required for anchorage purposes, covering an area of about 18 acres between the 15-foot curves and about 30 acres in all.

In its original condition the shoal in many places carried only 1 foot of water and was a very troublesome obstruction.

The project for the removal of this shoal was adopted August 5, 1886.

The sum of $104,250 was expended on this work up to June 30, 1904, by which 23.8 acres out of the original 30 of this shoal had been dredged to 25 feet depth, and a 16-foot depth had been secured over the central and largest portion of the shoal, in addition to a 20-foot depth in the main channel, making an important addition to the anchorage facilities of Providence Harbor.

In the river and harbor acts of June 13, 1902, and March 3, 1905, provision was made for the removal of the remaining portions of this shoal in connection with the project for an enlarged anchorage area in Providence Harbor, and all of the remaining portions of the shoal were removed under the appropriations made by these acts.

There has been some shoaling over those portions of the area dredged prior to this year, which probably extends along the eastern side of the recently dredged anchorage area.

The effect of the improvement is stated in connection with the report on Providence Harbor.

For reference to reports containing more extended information see Annual Report of the Chief of Engineers for 1905, page 85.

Widening approach channel between Kettle and Gaspee Points, removing Fields Point, etc.

Amount (estimated) required to be appropriated for completion of existing project	$30,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	30,000

ANCHORAGE AREA ON EAST SIDE.

Amount (estimated) required to be appropriated for completion of existing project	$164,800
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	164,800

CONSOLIDATED.

Amount (estimated) required to be appropriated for completion of existing project	194,800
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	194,800

HARBOR OF REFUGE AT POINT JUDITH, R. I.

Point Judith is the southern extremity of the township of Narragansett, R. I., and marks the southwestern entrance to Narragansett Bay. A long ledge, known as "Squid Ledge," projects over a mile from the shore in a direction south by east about 1.5 miles west of the point. This location was dangerous for vessels to pass during a storm, especially for the light-built barges bransporting coal from New York Bay points to Narragansett Bay.

The harbor protected by the breakwaters covers an area of about 3,800 feet in a northerly and southerly direction and about 3,400 feet easterly and westerly, with an entrance 1,200 feet wide and from 23 feet to 31 feet in depth on the southeasterly side, and one 1,500 feet wide on the western side with a depth of about 18 feet. It is about 23 miles easterly from Stonington Harbor, Conn., and about 50 miles westerly from Vineyard Haven, these being important harbors on the line of the very large traffic bound east and west past this point.

The existing project is the only one ever adopted for this locality.

The existing project, adopted by the act of September 19, 1890, was based on House Document No. 66, Fifty-first Congress, first session, and provides for the construction at this point of a national harbor of refuge nearly a square mile in area by means of two stone breakwaters. The main breakwater, built partly on Squid Ledge, is approximately V-shaped, facing outward in a direction about south by west, and lying at a considerable distance from the shore. Eastward of the main breakwater a detached breakwater, nearly parallel to the line of the eastern arm of the main breakwater prolonged shoreward, was planned to shelter the eastern entrance, so as to give protection against easterly, southerly, and westerly storms, the mainland itself forming a protection on the north, all at a total cost estimated 1889 at $1,250,000. This project was modified by the report of a board of engineers convened to consider and report upon the construction of this harbor, which was approved November 16, 1896, and provided for raising the crest of the eastern arm of the main breakwater and extending its western arm to its originally projected length, at an estimated cost of $444,311, and deferring the construction of the easterly detached breakwater as a part of the main project until the completion of the main breakwater should demonstrate its necessity or otherwise. (Annual Report of Chief of Engineers for 1897, p. 920.)

The river and harbor act of June 13, 1902, made a further modification by providing for the construction of the easterly detached breakwater and continuing it to the shore, at an estimated cost of $196,193 for the detached breakwater and $187,558.80 for the shore extension. (H. Doc. No. 53, 55th Cong., 1st sess.) A further modification was made by the act of March 2, 1907, authorizing an extension seaward to the easterly shore-arm breakwater at an additional estimated cost of $186,248.20, making the total cost of this breakwater $570,000. The river and harbor act of June 25, 1910, adopted so much of the plan of improvement set forth in House Document No. 911, Sixtieth Congress, first session, as provides for the construction of a detached westerly shore arm of the breakwater, at an estimated cost of $665,000, making the total estimated cost of the project $2,485,000.

The project as modified provides for the construction, first, of a V-shaped breakwater, designated the main breakwater, facing about south by west; second, the construction of an easterly shore-arm breakwater extending out from the shore toward the easterly arm of the main breakwater, leaving an entrance to the harbor 1,200 feet wide; third, the construction of a westerly shore-arm breakwater extending out from the shore toward the westerly arm of the main breakwater, leaving an entrance 1,500 feet wide; and, fourth, the raising of the crest of the easterly arm of the main breakwater to the level of 13 feet above mean low water instead of 10 feet as originally built.

The operations during the past fiscal year have been mainly on the construction of the westerly shore arm, which, since the new quarry of the contractors has been fairly opened, is progressing rapidly. A contract has been entered into for repairs to the most exposed parts of the main breakwater and the easterly shore arm. The expenditures have been mainly for new work; that for maintenance has been the slight expense incident to making the contract for repairs.

The sum of $1,877,111.69 has been expended on this work up to June 30, 1912, of which $55,217.13 was for maintenance.

About 80 per cent of the entire project as approved has been completed. By the expenditures made, the main breakwater had been built to a total length of 6,970 feet, with a height of 10 feet above mean low water, the easterly shore-arm breakwater had been completed for a distance of 2,240 feet out from the high-water line on shore to about 30 feet depth of water, and the foundation of the westerly shore arm had been placed for a length of 1,930 feet out from the shore and about 350 feet raised above the surface of the water.

Before the construction of the breakwater the area inclosed within the lines upon which it has been built and the shore was about 640 acres, of which 390 acres has over 25 feet of water and 198 acres additional over 18 feet. The 18-foot area and the whole water-covered area has since been considerably reduced by shoaling in the western part. It is expected the western shore arm will stop the inflow of sand.

The result of the improvement has been to create a harbor of refuge fairly suitable for sailing vessels and steamers, though the holding ground is poor, but not well suited for tows of barges, on account of the narrowness of the entrances, the direction of the entering courses with respect to that of the worst seas, the lack of room necessary for maneuvering barges in tow, and the fact that the central part of the area is obstructed by a dangerous reef.

About 30 feet can be carried at mean low water into the eastern, and from 18 to 19 feet into the western, entrance. The mean range of tide is 3.1 feet.

One hundred and seventy-three vessels used the harbor during the fiscal year. Of these there were 142 sailing vessels, 12 steamers, and 19 barges.

It is proposed to apply the funds asked for to constructing the westerly shore arm of the breakwater, which is the only part of the new project presented in House Document No. 911, Sixtieth Congress, first session, specifically adopted by Congress. Work on the other items of this project will await the future action of Congress.

Amount (estimated) required to be appropriated for completion of existing project	$290,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 290,000

PAWCATUCK RIVER, R. I. AND CONN.

The Pawcatuck River has its source in the southwestern part of Rhode Island, being formed by the junction of the Wood and Charles Rivers, and empties into the easterly end of Little Narragansett Bay. Its total length is about 18 miles and its general direction of flow is westerly and southerly; the lower 9 miles of the river forms the boundary between the States of Rhode Island and Connecticut.

The tidal and navigable part of the river extends 5 miles from Westerly, R. I., to its outlet in Little Narragansett Bay, through the northern part of which a navigable channel extends 2½ miles to Stonington Harbor, Conn., through which Long Island Sound is reached.

Before improvement the channel of the river was crooked and obstructed by numerous shoals and rocks, on some of which there was but 1 to 1½ feet of water, and the greatest depth that could be carried through the bay channel was 4½ feet.

The present project, adopted in 1896, provides for a channel 10 feet deep from Stonington, Conn., to Westerly, R. I., with a width of 200 feet from Stonington to Avondale, R. I., a distance of about 4 miles; a width of 100 feet from Avondale to the lower wharves at Westerly, a distance of about 3 miles; and a width of 40 feet between the upper and lower wharves of Westerly, a distance of about one-half mile, at a total estimated cost of $200,361.60. The river and harbor act of March 3, 1905, authorized the use of $1,000 of the appropriation for the improvement of the Pawcatuck River in the removal of obstructions at Watch Hill, at the southeastern part of Little Narragansett Bay. The greater portion of the obstructions was removed in January and February, 1906, at a cost of $865.82. The project has not been modified since its adoption.

For complete report with map upon which the project is based, see House Document No. 62, Fifty-fourth Congress, first session.

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[1] This estimate is for the sundry civil bill, being the balance not appropriated of previous contract authorizations.

The report, without map, was published in the Annual Report of the Chief of Engineers for 1896, pages 676–678.

During the fiscal year no work of improvement has been carried on. A careful survey of the channels was made, and bids were opened April 12, and a contract dated April 30 was entered into for dredging in the vicinity of Stantons Weir Point.

The amount expended on the project up to the close of the fiscal year ending June 30, 1912, was $78,578.53, of which $15,080.41 was applied to maintenance. The sum of $630.67 was received from the sale of the steamer *Castle*.

The project is about 30 per cent completed. A channel of project depth and 100 feet in width has been dredged through Little Narragansett Bay, about 10,400 feet in length; a channel of project dimensions, i. e. 10-foot depth and 100 feet in width, has been dredged from Avondale to the lower wharves at Westerly, a distance of about 14,000 feet, with the exception of a stretch in the vicinity of Stantons Weir Point about 1,800 feet long, now under contract; and a channel of project dimensions, i. e. 10 feet deep and 40 feet in width, has been dredged between the lower and upper wharves at Westerly, a distance of about 3,000 feet to the head of navigation.

The maximum draft which could be carried June 30, 1912, was 10 feet in the bay channel, 8 feet in the river, and 6 feet near Watch Hill. The mean rise of tide is 2.6 feet at the mouth of the river and 2.3 feet at Westerly.

The reported tonnage for the calendar year 1911 amounted to 53,921 short tons, mainly coal, lumber, and paving blocks, valued at $285,005.

The effect of the improvement is to permit coal, lumber, and building material to be delivered in vessels at Westerly, and to ship therefrom paving blocks and granite in vessels instead of by rail, thus giving water competition for these materials, with a resulting benefit in the reduction of freight rates.

For the purpose of maintaining the project as at present completed or under contract, and for the removal of bowlders and ledge rock, the sum of $6,000 can be profitably expended in the fiscal year ending June 30, 1914.

Amount (estimated) required to be appropriated for completion of existing project	$121,811.35
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	6,000.00

HARBORS AT FIVEMILE RIVER, GREENWICH, AND WESTPORT, AND SAUGATUCK RIVER, CONN.

(*a*) *Fivemile River Harbor.*—This harbor is about 3 miles to the southwestward of Norwalk Harbor and about 16 miles in the same direction from Bridgeport Harbor. It is a tidal inlet about 1 mile long and from 100 to 1,000 feet wide. The natural low-water depth at the mouth was about 3 feet, shoaling to zero about halfway up the harbor and to about plus 2.5 feet at extreme head. The original and present project of improvement, adopted under authority of the act of August 11, 1888, provides for a dredged channel 8 feet deep and 100 feet wide, extending up the harbor about 6,000 feet from its mouth. The estimated cost from the beginning, as revised in 1894, was $45,000.

No revision of the existing project has been made since its adoption except in regard to cost, which was originally estimated at $25,000, $20,000 being added to this estimate in 1894, as stated above.

During the fiscal year, those portions of the channel already dredged were restored to project dimensions.

The total amount expended on this project up to the close of the fiscal year ending June 30, 1912, was $45,900.92, of which $10,410.48 was applied to maintenance. The sum of $105.11 was received from the sale of the steamer *Castle*.

A channel of project dimensions has been dredged about 5,400 feet up the harbor, and thence about 200 feet farther with project depth and widths of 25 feet to 75 feet. No dredging has been done above this point. The project is about 82 per cent completed.

The maximum draft that could be carried June 30, 1912, through the improved channel was 8 feet to within about 200 feet of its head, thence about 6 feet to the head of the channel, above which point no navigation is possible except at high tide, when a draft of from 4 to 4½ feet can be carried for about one-fourth of a mile farther to the head of navigation. The mean rise of tide is about 7.2 feet.

The length of the channel as now dredged is 1.03 miles and the total length from the entrance to the head of navigation is about 1.27 miles.

The commerce of this harbor is mainly confined to the oyster industry. Tonnage reported for the calendar year 1911 amounted to 12,278 short tons, valued at $124,718.50.

The effect of the project on freight rates is unknown.

The available balance and future appropriations will be applied to maintenance of the improvement.

Owing to changes in local conditions since the existing project was adopted, the local officer is of the opinion that certain modifications of the plan of improvement would be desirable, and a reexamination of the locality with a view to revision of the project is therefore recommended.

(*b*) *Greenwich Harbor.*—This harbor is a shallow bay about 2 miles easterly from the New York State line and about 5 miles southwesterly, by water, from Stamford Harbor. It extends northward about a mile from the 9-foot curve in Long Island Sound to the head of navigation.

The original low-water depth was about 6 feet to the lower docks. Above this point it shoaled rapidly to 3 feet 1,000 feet above and to about plus 2 feet at the head of the harbor. The original and present project, adopted in the act of June 3, 1896, is to dredge a channel 90 feet wide from the mouth of the harbor to the causeway at its head, a distance of about a mile, to be 9 feet deep to the steamboat dock and 6 feet deep above, the upper end to be enlarged to form a turning basin. The estimated first cost was $20,000.

For map, report, and estimate on a desirable modification of the project see House Document No. 309, Sixty-first Congress, second session.

The project has not been modified since its adoption.

During the fiscal year the channels were restored to project dimensions.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $23,343.17, of which

$6,325.98 was for maintenance. The sum of $240.26 was received from the sale of the steamer *Castle*.

This project was entirely completed September 23, 1905, the dredging during the fiscal year being entirely for purpose of maintenance.

The work done has enabled vessels to enter the harbor with 9 feet draft at low tide, thus permitting the regular steamer to make trips without waiting for tide.

On June 30, 1912, draft of 9 feet at mean low water could be carried from the outer end to the head of the 9-foot channel at the steamboat dock and thence 6 feet to the turning basin at the head of navigation. The mean rise of tide is about 7.5 feet.

The length of the improved channel from the outer end to the head of the turning basin is 1 mile. No navigation is possible beyond this point.

The commerce of this harbor consists mainly of coal, lumber, building material, and general merchandise. The reported tonnage for calendar year 1911 amounted to 101,500 short tons, valued at $9,323,250.

It is reported that the result of the improvement has been to reduce freight rates.

The available balance and future appropriations will be applied to maintenance.

(*c*) *Westport Harbor and Saugatuck River, Conn.*—Saugatuck River is a tidal stream, the entrance to which is about 10 miles to the southwestward of Bridgeport Harbor. Its navigable portion extends inland about 4½ miles by course of channel from Long Island Sound to Westport, Conn. It has a natural depth of 5 feet at mean low water, in a rather narrow, crooked channel, up to the railroad bridge at Saugatuck, about 3 miles from the Sound; thence the depth, before improvement, decreased gradually until at Westport it was less than 1 foot. The channel was somewhat obstructed by rocks in its upper part.

For nearly 2 miles below Westport the stream is from 200 to 1,200 feet wide. Below this it expands into a rather broad inner bay, with a narrow channel following the west, south, and east shores and then turning abruptly to the southeast and passing to the Sound between Cedar Point on the north and Cockenoes Island on the south. On the south side of the inner bay lies Great Marsh, which is connected with Cockenoes Island by a broad sand flat, nearly bare at low tide; and east of the island a reef of bowlders extends eastward 1½ miles, so that the only entrance to the harbor at low tide is to the eastward of this reef.

The navigable part of the river is crossed by three bridges, all having draws of sufficient size for the commerce of the stream.

The present project, adopted in 1892, originally provided for a channel 4 feet deep and 60 feet wide up to Westport, at an estimated cost of $10,000.

As a result of a survey authorized by the act of August 18, 1894, the project was modified in 1896 to provide for repairing the Cedar Point Breakwater, removing a ledge opposite Stony Point or dredging around it, and removing bowlders from the channel, at an estimated cost of $8,000, and the total estimated cost was in consequence increased to $18,000.

The existing project, modified as stated above, now provides for a channel 4 feet deep and 60 feet wide up to Westport, for removing the ledge opposite Stony Point, for removing bowlders from the channel, and for repairing Cedar Point Breakwater, all at an estimated cost of $18,000.

No operations were conducted during the fiscal year.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $15,770.99, of which $610.44 was for maintenance. The sum of $126.13 was received from the sale of the steamer *Castle*.

The 4-foot channel has been completed to Westport with width generally of 60 feet, the ledge opposite Stony Point removed, and the Cedar Point Breakwater repaired and extended. The channel above referred to was completed in 1896, and since that time has much deteriorated, especially in the upper portions, and the Cedar Point Breakwater is again in need of repair.

The project is about 70 per cent completed. Its completion requires further removal of bowlders and dredging to full project dimensions in the upper portion of the channel and also repairs to the Cedar Point Breakwater.

The improvements made have rendered navigation of the river practicable at about one-half tide by small vessels and at high tide by lightly laden coal barges. The maximum draft that could be carried at mean low water on June 30, 1912, was about 6 feet from the outer end to the highway bridge at Saugatuck, thence about 3½ feet to the lowest docks at Westport; from this point the depth at mean low water rapidly diminished to nearly zero at the head of the west branch channel and to about 2 feet at the head of the improved channel in the east branch at the Westport drawbridge; above the drawbridge the bottom is bare or nearly so at low tide. The mean rise of tide is about 7 feet.

The commerce consists mainly of coal. The tonnage reported for the calendar year 1911 was 14,011 short tons, valued at $56,076.87.

The improvements made have not been sufficient to materially decrease freight rates, which are much higher in this harbor than in any other improved harbor in this vicinity.

Future appropriations will be applied to maintenance and the completion of the project.

CONSOLIDATED.

Amount (estimated) required to be appropriated for completion of existing project	$14,300
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	5,000

MILFORD HARBOR, CONN.

This harbor is about 8 miles to the southwestward of New Haven Harbor and about 10 miles to the northeastward of Bridgeport Harbor, both distances being measured by the ordinarily traveled water route. It is on the north shore of Long Island Sound and consists of a broad open bay about a mile square, from the head of which a small tidal stream extends nearly a mile inland to the head of navigation. The original depth on the bar in the bay at the mouth of the river was less than 2 feet. In parts of the river the channel ran nearly bare.

The existing project, authorized by act of June 13, 1902, for completion in accordance with plan printed in House Document No. 280, Fifty-sixth Congress, first session, at a cost of $15,000, consists in dredging and maintaining a channel across the bar and through the lower harbor, 100 feet wide and 10 feet deep, to Merwins Wharf, with an anchorage basin of same depth of about 5 acres area on the east side of the channel between the long dike and the harbor line, and a channel through the upper harbor from Merwins Wharf to the Straw Works Wharf, 90 feet wide and 6 feet deep. The estimated cost for maintenance was $1,000 biennially. The first cost of the improvement was subsequently ascertained to be $25,000.

No operations were conducted during the fiscal year. The expenditures reported were incurred in the identification of established harbor lines, collection of commercial statistics, and apportionment of office expenses.

The amount expended on this project to June 30, 1912, is $23,924.49, of which $307.16 was for maintenance.

The 10-foot channel has been completed to full project dimensions; the 6-foot channel has been completed to full project dimensions to a point about 500 feet above the town dock; a portion of the anchorage basin, about 2½ acres in area, on the east side of and adjacent to the 10-foot channel, dredged, and a basin 1.6 acres in area dredged on the opposite side of the channel, opposite Merwins Wharf. Owing to the ledge rock it was impracticable to complete the basin originally contemplated on the east side of the channel and to extend the 6-foot channel up to the Straw Works Dock without exceeding the estimated cost. The basin dredged on the west side of the channel was intended to in part take the place of that portion of the basin on the east side which was omitted on account of ledge rock. The work done facilitates navigation in the lower part of the harbor and the extension of the 6-foot channel to the town dock renders it practicable to land cargoes there, which it was formerly extremely difficult to do. The development of the anchorage basins greatly relieves congestion in the lower part of the harbor, which is much frequented by pleasure and oyster craft, but the existing anchorage room is insufficient.

On June 30, 1912, a low-water draft of 9 feet could be carried over the bar and up as far as Merwins Wharf, thence 6 feet draft to just above the town dock, and thence draft of about 2½ feet can be carried to the Straw Works Dock.

The mean rise and fall of tide in this harbor is about 6.2 feet and the maximum amount approximately twice as much. The length of the improved channel from the outer end to its head is 1.2 miles; from the head of the improved channel to the Straw Works Dock is about one-tenth of a mile; no navigation is practicable above this dock.

The commerce of this harbor consists entirely of oysters, shells, coal, and fertilizer, the former predominating. The reported tonnage for the calendar year 1911 amounted to 34,350 short tons, valued at $634,870.

The effect of this improvement on freight rates is not positively known, but is believed to have resulted in reducing them.

The available balance and future appropriations will be applied to maintenance of the improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement.. $5,000

NEW HAVEN HARBOR, INCLUDING WEST RIVER, CONN.

The project adopted by the act of March 3, 1899, is in accordance with plan printed in House Document No. 82, Fifty-fifth Congress, first session, and provided for a channel 20 feet deep, 400 feet wide, and 4 miles long from Long Island Sound to Canal Dock; thence of same depth, 300 feet wide, one-half mile to Tomlinson Bridge; three anchorage basins below Tomlinson Bridge of 20, 16, and 12 feet depths; a channel up Quinnipiac River 200 feet wide and 12 feet deep to Grand Avenue; and a channel up Mill River 12 feet deep and 200 feet wide to the junction of the two branches above Chapel Street, and thence 12 feet deep and 75 feet wide up each branch to Grand Avenue.

The river and harbor act of March 2, 1907, consolidated the improvement of West River with that of the main harbor, of which the former is a branch.

The river and harbor act of June 25, 1910, modified the project in accordance with report printed in House Document No. 1159, Sixtieth Congress, second session, so as to provide for deepening the 12-foot anchorage basin to 15 feet, dredging a channel 100 feet wide and 12 feet deep from the 12-foot anchorage basin toward Brewery Street about 1,500 feet, and the removal of certain obstructive rocks in Morris Cove, at an estimated cost of $68,000, which amount was appropriated by the act.

The river and harbor act of July 25, 1912, modified the project in accordance with report printed in House Document No. 26, Sixty-second Congress, first session, so as to provide for widening the east and west branch channels in Mill River from the point of bifurcation northerly to Grand Avenue, the east branch channel to width of 100 feet and the west branch channel to general width of 125 feet, increased to 150 feet at the turn and decreased to 75 feet at the head; also for a channel 8 feet deep and 75 to 100 feet wide in the Quinnipiac River between Ferry Street and Grand Avenue, all as shown on accompanying maps, and at a total estimated cost of $19,200. This act still further modified the project in accordance with report printed in House Document No. 535, Sixty-second Congress, second session, so as to provide for deepening the West River channel to 12 feet and providing additional width of from 25 to 50 feet at the turns and along the West Haven water front; also for extending this channel with depth of 12 feet and prevailing width of 75 feet from the Kimberly Avenue Bridge upstream approximately to the bridge of the New York, New Haven & Hartford Railroad Co.; also for dredging an anchorage basin 6 feet deep opposite Maher's Dock and to the southward of the channel, all as shown on accompanying map, and at an estimated cost of $50,000 and $4,000 annually for maintenance. This act appropriated $19,200 for the first-named improvement and $54,000 for the second, being the estimated cost and maintenance for one year.

The existing project is the project of 1899 modified and extended as above, and now provides for a channel 20 feet deep, 400 feet wide, and 4 miles long from Long Island Sound to Canal Dock; thence of same depth, 300 feet wide, one-half mile to Tomlinson Bridge.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $416,977.51, of which $94,220.98

was for maintenance. Of the amount reported expended on existing project, $38,500 was expended on West River prior to its consolidation with the general project. The sum of $420.45 was received from the sale of the steamer *Castle*.

The existing project is about 90 per cent completed. The only portion remaining to be done is that portion of the project adopted by the act of July 25, 1912, viz, widening and deepening the West River Channel and extending it to the railroad bridge, dredging the 6-foot anchorage basin, widening the Mill River channels above Chapel Street, and dredging the 8-foot channel in the Quinnipiac River between Ferry Street and Grand Avenue, uniting the two short channels already dredged there.

The work done has enabled deeper draft vessels to use the harbor than was formerly possible, with the resulting reduction of freight rates due to the larger vessels and increased facilities for handing freight made possible thereby. The West River Channel has greatly facilitated the oyster business at Oyster Point, which could not be carried on to its present extent without this channel; and the 12-foot channel northerly toward Brewery Street has made this portion of the harbor available for much deeper draft vessels than were formerly used.

The maximum draft which could be carried June 30, 1912, through the main channel to Tomlinson Bridge was about 20 feet at mean low tide; above Tomlinson Bridge the maximum low-water draft which could be carried up Mill River to Grand Avenue Bridge was 12 feet in both branches; up Quinnipiac River to Ferry Street Bridge 12 feet, and from Ferry Street Bridge to Grand Avenue a little more than 6 feet; up West River to the railroad bridge 7 feet, and through the 12-foot channel to Brewery Street 12 feet.

The commerce of New Haven Harbor is mainly in coal, lumber, iron and steel (raw and manufactured), oysters and oyster shells, building material, petroleum products, fertilizer, and general steamboat freight. The reported tonnage for the calendar year 1911 was 1,995,401 short tons, valued at $124,261 691.17.

The precise effect of the project on freight rates is unknown, but the rates to New Haven are materially less than to other cities in the immediate vicinity without water facilities or with inadequate ones.

The available balance and future appropriations will be applied to the completion and maintenance of the project.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement.. $10,000

CONNECTICUT RIVER BELOW HARTFORD, CONN.

The source of the Connecticut River is Connecticut Lake, in the extreme northerly portion of New Hampshire. It flows in a southerly direction between that State and Vermont, forming the boundary line between these two States, and through Massachusetts and Connecticut, emptying into Long Island Sound at Saybrook, about 30 miles to the eastward of New Haven and about 14 miles to the westward of New London. Its total length is about 345 miles, and its entire watershed is 11,085 square miles. The section included in this project is 51.9 miles long and extends from Hartford to Long Island Sound. Before beginning improvement the available depth over Saybrook

Bar at the mouth of the river was 7 feet at mean low water; thence to Hartford the available depth over the shoalest of the river bars was about 5 feet at low water, being generally at its minimum after the spring freshets and increasing as the period of summer low water continued.

The original project, adopted in 1836, provided for the removal of the Saybrook Bar by dredging. Up to 1843 an 11 to 12 foot channel had been dredged 50 feet wide and 1,500 feet long, at a cost of $23,471.57. No further work was done until 1870, by which time the dredged channel had been nearly obliterated by storms and freshets.

A project for permanent improvement was adopted in 1870 and modified in 1873 and 1880, under which two jetties were built at Saybrook Bar and dikes constructed at Hartford and Glastonbury Bars.

In 1887 a project was adopted and modified in 1890, which provided for maintaining the navigable channel by completing two jetties at Saybrook Bar to a height of 5 feet above high water, with top width of 6 feet and side slopes of 1 on 1; raising the training wall, nearly 3,700 feet long, at the Hartford Bars as might be found necessary by experience, but not to exceed 15 feet above low water; dredging the channel between the jetties at the mouth of the river to depth of 12 feet and width of 400 feet, and maintaining the channel in the river by annual dredging at the various bars to about 10 feet depth at mean low water and to a width as near 100 feet as practicable, at an estimated cost of $130,000, and $10,000 annually for dredging for maintenance.

For scope and history of the modifications see pages 120 and 121, Annual Report of the Chief of Engineers for 1900.

The act of June 13, 1902, authorized an expenditure of $1,000 for removal of obstructions at mouth of Salmon River, a tributary to the Connecticut River.

Up to the time of the adoption of the present project $625,910.50 had been expended on this improvement, of which $362,007.78 had been applied to maintenance.

Under previous projects the maintenance of river-bar channels by annual dredging has been held paramount, and under the project of 1887, as modified in 1890, a channel 200 feet wide and 12 feet deep at mean low water, which was dredged through Saybrook Bar between the jetties, has been well maintained by the jetties, and annual dredging at the river bars has generally kept a channel about 50 feet wide open, so that Hartford-New York steamers and barges drawing from 9 to 11 feet, according to the river stage, have been but little detained, and then only at summer low river and before completion of the annual dredging.

The river and harbor act of February 27, 1911, adopted the project printed in House Document No. 1294, Sixty-first Congress, third session, and appropriated $77,000 for the work, and authorized the Secretary of War to enter into contracts for the completion of the project to the extent of $100,000 in addition to the amount appropriated. The project named in the House document above referred to provided for a channel 12 feet deep and 100 feet wide at mean low water (2 feet on the Hartford gauge) from Hartford to the bar at the mouth of the river and for a channel across the bar 300 feet wide and 15 feet deep at mean low water, the channels to be obtained by dredging and the construction of dikes, training walls, and revetments at an estimated cost as follows:

Channel in the river: Dredging 250,000 cubic yards, at 11 cents	$27,500
Bar at mouth of river: Dredging 165,000 cubic yards, at 20 cents	33,000
Dikes, training walls, and revetments	100,000
Total	160,500
Superintendence, contingencies, etc	16,500
Total	177,000

Fifteen thousand dollars per annum will be required for maintenance until such time as dikes and training walls are completed, and $7,000 per annum for maintenance thereafter. The project also provides for the maintenance of the jetties at the mouth of the river. This project has not been modified since its adoption.

For complete report on the survey authorized by the act approved March 3, 1909, and on which the present project is based, see House Document No. 1294, Sixty-first Congress, third session. Maps of this survey are not published. The river from the Sound to Hartford is shown on Coast Survey Charts Nos. 252–256.

During the fiscal year the river-bar channels have been kept open for navigation by maintenance dredging and snagging; a channel 300 feet wide and 15 feet deep across the bar at the mouth was begun; a new channel was dredged at Dividend Bar to full project dimensions, and the dikes, revetments, etc., authorized by the existing project were designed and located and a subproject approved for the construction of these works.

The amount expended on this project up to the close of the fiscal year ending June 30, 1912, was $25,010.45, of which $11,195.28 was applied to maintenance. The sum of $840.90 was received from the sale of the steamer *Castle*.

The completion of this project is to be accomplished under continuing contract appropriations, and the balance of the authorization remaining to be appropriated is $60,000.

The proportion of the existing project accomplished up to June 30, 1912, is about 3 per cent, disregarding work done for maintenance. Sufficient work has not yet been done on the permanent improvements under this project to be of any material benefit to commerce, but the maintenance of the river-bar channels has been of the greatest benefit to commerce, which could not be carried in anything like its present volume without this work.

The maximum draft which could be carried at mean low water over the shoalest river bar on June 30, 1912, was about 10 feet. The mean rise of tide is 3.4 feet at Saybrook jetties, and, on low river, 1.2 feet at Hartford. The average annual variation in the height of the river at Hartford is at least 16 feet and the maximum 6 or 7 feet more. This variation decreases rapidly from Hartford toward the mouth, where the annual variation is due to the rise and fall of tide, which probably rarely exceeds 5 feet. The length of the river under improvement from the mouth to Hartford is 51.9 miles.

The reported tonnage for the calendar year 1911 amounted to 683,326 short tons, mainly coal, lumber, building materials, fertilizer, petroleum products, and miscellaneous steamboat freight, valued at $23,537,837.81.

The work done has reduced freight rates to Hartford and lower river ports materially and has also greatly facilitated the delivery of coal and other freight. Without the improvements there could be but little freight traffic on the river.

The available balance and future appropriations will be applied to the maintenance of the river-bar channels, to completion of the channel at the mouth of the river, and to the construction of dikes, training walls, and revetments authorized by the project. The additional work proposed is necessary to make the improvement available.

Amount (estimated) required to be appropriated for completion of existing project	$60,000
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	60,000
For maintenance of improvement	15,000
Total	75,000

HOUSATONIC RIVER, CONN.

This is a rapid river, rising in the Hoosac Mountains in the northwestern part of Massachusetts, running in a general southerly direction through Massachusetts and Connecticut and emptying into Long Island Sound east of Stratford Point, about 5 miles to the eastward of Bridgeport Harbor. Its total length is about 130 miles. At Derby, about 13 miles from its mouth, it receives the discharge of the Naugatuck River, and about a mile above this point there is a large power dam across the Housatonic River. Above the pool of the dam the river is rocky and shoal. Derby and Shelton are at the head of navigation.

The original project for improvement, adopted under the act of March 3, 1871, provided for a jetty at Sow and Pigs Reef, removing Drews Rock, a breakwater at the mouth of the river, and making a channel 7 feet deep 200 feet wide through the bar at the mouth and 150 feet wide in the river, at total estimated cost of $404,961. In 1887 the estimates were revised, and a modification of the project proposed a breakwater or jetty at the mouth of the river 5,750 feet long, extending about south-south-east from Milford Beach 3,250 feet, thence parallel to and 500 feet from the channel 2,500 feet farther, to the 12-foot curve in Long Island Sound; the inner arm of the jetty to be 3 feet above mean low water, top width 6 feet, side slopes 1 on 1; the outer arm to be 6 feet above high water, top width 12 feet, outer slope 1 and 2, inner slope 1 on 1; and a channel 7 feet deep, 200 feet wide at the outer bar, and 100 feet wide through the river, at a total estimated cost of $202,000 and $4,000 annually for maintenance, all in addition to amount already expended. This modification was adopted under the act of August 11, 1888, and work on the breakwater was begun July 10, 1889. In 1893 the project was further modified to provide for building a small dike in the river below Stratford.

The present project for improvement is the project of 1871, modified as stated above, and provides for a jetty at Sow and Pigs Reef; removing Drews Rock; a breakwater or jetty at the mouth of the river 5,750 feet long, extending about south-southeast from Milford Beach 3,250 feet, thence parallel to and 500 feet from the channel, 2,500 feet farther, to the 12-foot curve in Long Island Sound, the inner arm of the jetty to be 3 feet high above mean low water, top width 6 feet, side slopes 1 on 1; the outer arm to be 6 feet high above high water, top width 12 feet, outer slope 1 on 2, inner slope 1 on 1; a riprap dike in the river below Stratford not to exceed 1,500 feet in length; and a channel 7 feet deep at mean low water, 200 feet wide across the outer bar, and 100 feet wide through the river, all at a total estimated cost of $275,500.

Up to June 30, 1912, $292,254.13 had been expended on this project, of which $86,170.79 had been applied to maintenance; $1,051.12 was received from the sale of steamer *Castle*.

At the close of the fiscal year the project was completed, except that the outer arm of the breakwater was not to full projected cross section, being only about 4 feet high above high water and considerably narrower and with steeper side slopes than are desirable for permanence; also it is possible that the Stratford dike, now 1,115 feet long, may need somewhat further extension, but this is considered rather improbable.

The work done has enabled vessels to enter the river in safety instead of waiting for high tide in an exposed situation outside, and has made possible the navigation of this river at nearly all stages of the tide by the classes of vessels which ordinarily use it. A large part of the commerce could not be carried on without the improved channel. The navigable channel to Derby and Shelton has materially reduced freight rates at these and adjacent towns, as otherwise all freight would have to be handled by rail and with no competition. On June 30, 1912, approximately 7 feet draft at mean low water could be carried across the outer bar and thence to the head of navigation at Derby and Shelton. The mean rise of tide is about 6.3 feet at the mouth of the river and 4.2 feet at Derby. Spring freshets in the river at Derby occasionally rise to 10 feet or more above mean high tide at that point.

The total length of that portion of the river under improvement, between the mouth and Shelton, is 13.3 miles; above this point the river is only navigable by small pleasure craft, etc., of light draft and for about three-quarters of a mile. A dam at Shelton makes navigation impossible above this point.

The commerce is principally coal, building materials, and petroleum products. A considerable quantity of oyster shells is shipped from near the mouth of the river. The reported tonnage for the calendar year 1911 was 97,098 short tons, valued at $534,098.85.

The precise effect of the improvement on freight rates is unknown, but it is known that the freight rates by rail to Derby and Shelton are considerably less than to other towns in the immediate vicinity not situated on a navigable waterway, and the freight rates by water to Derby and Shelton compare favorably with similar rates to other towns of equal size on Long Island Sound.

The available balance and future appropriations will be applied to maintenance and completion of the project.

Owing to changes in local conditions since the existing project was adopted, the local officer is of the opinion that certain modifications of the plan of improvement would be desirable, and a reexamination of the locality with a view to revision of the project is therefore recommended.

Amount (estimated) required to be appropriated for completion of existing project	$53, 941. 21
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	20, 000. 00

MYSTIC RIVER, CONN.

Mystic River is a narrow tidal stream in the eastern part of the State of Connecticut. The river extends in a general northeasterly direction for about 6 miles from Fishers Island Sound past the villages of Noank, West Mystic, and Mystic to Old Mystic. The village of Mystic lies on both the east and west banks of the river, about 3 miles above Fishers Island Sound, the westerly portion being in the town of Groton and the easterly portion in the town of Stonington. At this point the river is crossed by a highway drawbridge, and that portion of the river lying above this drawbridge constitutes the portion under consideration. On this stretch there are several points at which there is a commerce amounting to about 10,000 tons of coal. It seems probable that better facilities would result in other commodities which are now handled by rail using this waterway, and that the amount of commerce would be increased.

The following letter of the Acting Chief of Engineers submitting report on a recent survey is printed in House Document No. 637, Sixty-second Congress, second session:

War Department,
Office of the Chief of Engineers,
Washington, March 20, 1912.

Sir: I have the honor to transmit herewith, for transmission to Congress, reports dated June 21 and November 14, 1911, with map, by Capt. A. E. Waldron, Corps of Engineers, on preliminary examination and survey, respectively, of Mystic River, Conn., from the drawbridge between Groton and Stonington to the head of navigation, called for by the river and harbor act approved February 27, 1911,

On June 18, 1900, there was completed by the General Government a channel 15 feet deep at mean low water and 100 feet wide in Mystic River up to the highway bridge at Mystic. Above this bridge no work of improvement has been done by the United States. The improvement desired is the extension of the existing project above the drawbridge to the head of navigation at Half Way Dock, a distance of about 1¼ miles.

The district officer states that the cost of providing a channel above the bridge of the same dimensions as below would be excessive, and he presents, with favorable recommendation, a plan for dredging a channel 12 feet deep at mean low water with a general width of 100 feet from the bridge up to a point about 700 feet northerly from the wharf of the Mystic Manufacturing Co., a distance of about 4,500 feet, at an estimated cost of $8,160, with $1,000 every 10 years for maintenance. For the reasons given in his report the division engineer does not concur in the recommendation of the district officer.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated March 4, 1912, concurring in the recommendation of the district officer.

After due consideration of the above-mentioned reports, I concur in general with the views of the district officer and the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report that the improvement by the United States of Mystic River above the drawbridge at Mystic Conn., is deemed advisable so far as to secure an available channel depth of 12 feet at mean low water and a general width of 100 feet, increased at bends as indicated on the accompanying map, at an estimated cost of $8,160 for first construction and $1,000 every 10 years for maintenance, these estimates being based on the supposition that the work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of the entire estimated cost of improvement.

Very respectfully,

Edw. Burr,
Acting Chief of Engineers.

The Secretary of War.

THAMES RIVER, CONN.

The Thames River is a tidal stream, 15 miles in length, having its source and head of navigation at the junction of the Shetucket and Yantic Rivers at Norwich, Conn. It flows in a southerly direction and empties into Long Island Sound at New London, the lower 3 miles constituting New London Harbor. Before improvement for 4 miles below Norwich the natural depths were 6 feet or more at low water, with widths of 400 to 1,000 feet. Below this point depths were 13 feet or more and widths 800 to 3,000 feet.

The original project, adopted in 1836, provided for a channel 11 feet deep at low water, to be secured by dredging and building dikes. On this project $40,300 had been expended when, in 1839, work was stopped, the project not having been completed.

The existing project, adopted June 23, 1866, and modified in 1879, 1882, 1888, 1892, 1907, and 1910, is to dredge and build training walls to secure a channel 200 feet wide, with depths of 20 feet, from New London to Allyns Point, and 14 feet thence, 5 miles, to Norwich; to dredge Shaws Cove at New London to a depth of 12 feet; and to remove rocks and other obstructions in Shetucket River at Norwich. Estimates of cost were $473,870 for construction and $9,500 annually for maintenance. By the act of June 25, 1910, the improvement of Shaws Cove was made part of the project for New London Harbor.

For complete reports upon which the existing project and modifications are based see Annual Report of the Chief of Engineers for 1866, Part IV, page 197; for 1879, page 332, without map; for 1882, pages 606–607, with map in two sheets; for 1888, page 523 (reference to report), without map; House Document No. 73, Fifty-first Congress, second session, published in Annual Report of the Chief of Engineers for 1891, page 833 et seq., without map; House Document No. 265, Fifty-ninth Congress, second session, with map; and House Document No. 397, Sixty-first Congress, second session, with map. For reference to examination of west channel from Poquetanuck drawbridge to Kitemaug, not a part of project, see House Document No. 260, Sixty-second Congress, second session, without map.

The project, as modified, provides for a channel 200 feet in width and of 20 foot depth up to Allyns Point; thence of the same width and 14 feet deep to the head of navigation at Norwich; the construction of five training walls, located, respectively, at Mohegan, Trading Cove, Long Rock, Rolling Mill, and Norwich, with their tops at mean high water; and the removal of rocks and other obstructions in the Shetucket River at Norwich.

During the fiscal year the obstructions in Shetucket River were removed under open-market agreement at a cost of $1,500. An examination of the 14-foot channel from Allyns Point to Norwich disclosed several shoals, and under date of June 29, 1912, advertisements were issued for restoring and completing the channel to project dimensions.

The amount expended on the project (including Shaws Cove prior to June 25, 1910), up to the close of the fiscal year ending June 30, 1912, was $473,290.18, of which $33,446.99 was applied to maintenance. The sum of $504.54 was received from the sale of the steamer *Castle*.

The project has been completed, except that part of the channel between Allyns Point and Norwich is slightly deficient in width, a channel 200 feet in width and 20 feet in depth having been dredged at Barletts Crossover and the natural channel opposite Montville upper docks having been increased in width to 200 feet and 20 feet in depth; a channel 200 feet in width, except for about 2,000 feet in the vicinity of Waldens Island, where it has a width of 175 feet and 14 feet in depth, has been dredged from Allyns Point to Norwich; the five training walls have been completed, with the exception of the upper end of Rolling Mill dike, which has become unnecessary because of adjacent shore improvements; and the obstructions have been removed from Shetucket River.

The maximum draft which could be carried June 30, 1912, to Allyns Point was 20 feet; from thence to Norwich, 13 feet; and in the Shetucket River, 12 feet to the town dock.

The mean range of tide is 2.6 feet at New London and 3.1 feet at Norwich.

The reported tonnage for the calendar year 1911 amounted to 480,445 short tons, mainly coal, steamboat freight, and lumber, valued at $7,063,796.39.

The work done has reduced the cost of transportation by enabling freight to be brought in vessels of 16 and 22 foot draft instead of 8-foot draft. The river commerce of the present day could not be carried except for the increased depths thus obtained.

For the purpose of maintaining the improvement the repair of the three lower training walls, Mohegan, Trading Cove, and Long Rock, should be undertaken, and the amount which can be profitably expended for this work in the fiscal year ending June 30, 1914, is $12,000.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$12.000

HARBOR AT BUFFALO, N. Y.

The outer harbor is about 4½ miles long and 1,600 feet wide and the inner river and canal and basin harbor about 7 miles long and 200 feet wide; project depth, 23 feet at mean lake level. Buffalo Creek was the original harbor of the port of Buffalo. In its original condition the entrance channel from the lake was shallow and frequently closed by a gravel bar.

The amount expended on original project prior to operations under existing project was $2,837,995.37.

The existing project, dated June 3, 1896, with modifications to date, is as follows:

(*a*) To build an extension of the breakwater to Stony Point, leaving the necessary openings for the convenience of commerce.

(*b*) To extend the sand-catch pier to the established pierhead line.

(*c*) To build an arm 1,000 feet long to the Stony Point section of breakwater for the purpose of protecting the south harbor entrance.

(*d*) To maintain existing structures by strengthening timber-crib concrete portions and by making repairs and replacing the wooden superstructure of the breakwater with concrete and stone when necessary, and to maintain the north entrance channel 23 feet deep at mean lake level.

(*e*) To dredge to a depth of 23 feet at mean lake level an area at south end of harbor sufficient to provide access to canals of Lackawanna Steel Co. and Buffalo & Susquehanna Iron Co.

(*f*) To remove to a depth of 23 feet a shoal outside the main or north entrance to harbor.

(*g*) Removal of additional shoals outside north entrance to harbor.

(*h*) Removal of Watson elevator site.

Of the above items (*a*), (*b*), (*c*), (*e*), and (*f*) have been completed, (*d*) will be required indefinitely, and (*g*) and (*h*) are in progress, to be completed during the season of 1913.

The amount expended to June 30, 1912, was $5,752,028.94, of which $2,914,033.57 has been expended on existing project. It is impracticable to separate the costs of construction and maintenance.

During the fiscal year minor repairs were made on the breakwater and contract was made and work was commenced upon removal of the Watson elevator site and of additional shoals outside north entrance to harbor, and for dredging the north entrance channel. At the close of the fiscal year work had been fairly started on all of the three items.

For reports of surveys, see page 3152, Report of Chief of Engineers for 1895, House Document No. 35, Fifty-eighth Congress, second session; House Document No. 240, Fifty-ninth Congress, first session; House Document No. 298, Sixty-first Congress, second session; and House Document No. 550, Sixty-second Congress, second session. For report of preliminary examination with a view to widening and improving the entrance to Erie Basin, see House Document No. 327, Sixty-first Congress, second session.

The maximum draft that could be carried June 30, 1912, at mean lake level over the shoalest part of the locality under improvement was 20 feet. The usual variation of level of water surface is 3 feet, with a maximum variation, by gales, of 5 feet below and 6½ feet above mean lake level.

A good harbor has been obtained. The principal harbor works are the north and south piers and the north entrance channel between them at the mouth of Buffalo Creek, in which most of the business of the port is done, and the outer breakwater system, consisting of four sections of breakwater, of an aggregate length of 23,600 feet, inclosing an outer harbor 4½ miles long and over one-half mile wide. This breakwater system comprises 8,894 linear feet of breakwater of timber-crib-concrete type, 8,250 linear feet of stone or rubble-mound type, 2,633 feet of timber-crib-stone type, and 3,823 feet of timber-crib type.

The entrance channel has been dredged 23 feet deep at mean lake level for a width of 200 to 300 feet for 2,200 feet outward from outer end of north pier, 150 feet wide between the piers to its inner end (junction of Buffalo River and city ship canal), except over an area of rock at that point, where the depth is from 21½ to 23 feet.

Dredging is in progress, under contract, to increase the width to 400 feet outward from the outer end of the south pier, to increase depth over the rock area to 23 feet, and to redredge the channel where necessary.

The outer harbor has an area of about 680 acres; over 570 acres of the area the depth of water is 19 to 30 feet at mean lake level, and over the remainder, along the harbor line, the depth is 15 to 19 feet.

The south harbor entrance is over 28 feet deep. The north harbor entrance has controlling depth of 21.7 feet at mean lake level in a 400-foot channel way over rock reef outside of the breakwater.

In addition to providing a safe place of refuge and anchorage it is used as a channelway by lake vessels entering at the north entrance and bound for the Lackawanna Steel Co., the Buffalo & Susquehanna Iron Co., and the Pennsylvania Railroad Co., ore docks at the south end of the harbor; also by vessels entering at the south entrance bound for the Buffalo River or inner harbor. Such use by the largest and deepest draft vessels on the Lakes is extensive, but under present conditions the depth of water is not adequate for safe unobstructed navigation and for the maneuvering of deep-draft vessels going to or leaving anchorage or moorings. The adequate depth required is 20 feet at all stages of water level; and to secure this depth at low water, which occurs annually after September, a depth of 23 feet at mean lake level is required.

The deepening of the outer harbor and the north entrance thereto was the subject of a preliminary examination and survey; and report thereon is printed in House Document No. 550, Sixty-second Congress, second session. The river and harbor act approved July 25, 1912, adopted the project presented in this document, which contemplates securing an available depth of 23 feet at mean lake level in the outer harbor over the areas designated A and B on map accompanying said document, and depths of 23 and 25 feet, respectively, over the areas designated D and C at the north entrance, at an estimated cost of $624,750 for first construction, with $1,000 annually for maintenance. The first appropriation recommended, $290,000, was made by the act.

The commerce of Buffalo is large. During the year 1911 there were 6,487 arrivals and departures of vessels by lake and river, with 12,417,862 short tons of freight.

The arrivals and departures of canal boats by the Erie Canal were 2,968, with 1,291,418 short tons of freight.

The principal receipts by lake and river were wheat, corn, flour, oats, iron ore, lumber, copper, pig iron, glucose, lard, and pork. The total receipts amounted to 7,641,841 short tons.

The shipments by lake were principally coal, sugar, salt, manufactured iron, and cement, and aggregated 4,776,021 short tons.

For comparison the following table is given, showing the arrivals and departures by lake and canal and the freight tonnage for the past five years:

Years.	Lake.		Canal.	
	Number.	Short tons.	Number.	Short tons.
1907	8,205	16,487,240	5,014	1,942,455
1908	6,191	12,178,874	4,482	1,621,527
1909	6,659	14,145,013	4,230	1,568,615
1910	7,137	14,755,717	4,124	1,534,706
1911	6,487	12,417,862	2,968	1,291,418

Total shipments and receipts: 1910, 16,290,423 short tons; 1911, 13,709,280 short tons.

The project is reported to have a material effect in controlling freight rates on bulk commodities such as coal, grain, lumber, and ore.

Funds on hand are sufficient for ordinary maintenance during the fiscal year ending June 30, 1914, and no appropriation of funds therefor is recommended.

For improvement under the new project adopted in the river and harbor act of 1912 a succeeding annual appropriation of $167,375, in accordance with House Document No. 550, Sixty-second Congress, second session, is recommended.

Amount (estimated) required to be appropriated for completion of existing project	$334, 750
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	167, 375

HARBOR AT CAPE VINCENT, N. Y.

This harbor in its original condition was an open roadstead on the St. Lawrence River, 2½ miles from Lake Ontario, and is a convenient location for vessels to lie during storms, at night, and in thick weather. It consists of a river wharf frontage 1½ miles long and 500 feet wide, 12 feet deep at wharves, increasing to 23 feet deep a breakwater.

The original project of 1896 was to build a breakwater 1,600 feet long, parallel to and 600 feet from the railroad wharf, at an estimated cost of $320,000. On May 13, 1899, this project was modified to build a breakwater parallel to and 500 feet from the railroad wharf 1,550 feet long, of which length 150 feet, or so much thereof as required, was to be shore return at upper end, at an estimsted cost of $200,000. This is the existing project, which is, including work in progress, three-fourths completed. Nine hundred and ten feet of this breakwater, of which 50 feet is shore return, has been built and construction, under contract, of 220 feet is in progress. Farther extension of the shore return is not considered necessary. This improvement is intended to make a harbor of refuge for all craft plying between Lake Ontario and the St. Lawrence River.

During the fiscal year a contract was made to extend the breakwater 220 feet, and the work is fairly under way, to be completed during the next fiscal year. A watchman was employed through the year to regulate mooring of vessels to the breakwater.

The amount expended to June 30, 1912, was $132,148.55, of which $389.80 was for maintenance.

The maximum draft that could be carried over the locality under improvement at low water June 30, 1912, was 19 feet, and the usual variation of level of water surface is 3 feet.

The following is a statement of the commerce of this port, in short tons, for 10 years: 1902, 4,175; 1903, 15,666; 1904, 20,083; 1905, 21,750; 1906, 112,501; 1907, 21,946; 1908, 33,573; 1909, 42,077; 1910, 33,344; 1911, 13,178.

The project has provided facilities that make navigation more safe and thus affects freight rates.

Work proposed for the fiscal year ending June 30, 1914, is the further extension of the breakwater, and the appropriation recommended is the balance of the original but inadequate estimate to complete the project.

Amount (estimated) required to be appropriated for completion of existing project	$36,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	36,000

FLUSHING BAY.

Flushing Bay is on the north shore of Long Island, about 14 miles by water from the Battery, New York City. The bay is about 1 mile wide and 2 miles long, the depth in the original channel, not well defined, being not much greater than elsewhere in the bay. Before improvement the controlling depth up to Flushing was 3.9 feet at mean low water.

The existing project, adopted March 3, 1879, and modified September 19, 1888, and June 9, 1891, provides for building a dike 4,663 feet long on the west side of the channel to protect it from filling and for making and maintaining a channel 6 feet deep at mean low water up to the lower bridge at Flushing. Estimated cost, $173,500.

Up to June 30, 1912, $172,587.74 had been expended on the project. During progress of work it has been repeatedly necessary to redredge some parts of the channel, so that it is not possible to state exactly what part of above sum was used for maintenance. The expenditure to June 30, 1912, for maintenance is estimated at $24,958.79.

During the year 43,891 cubic yards of material were removed from the channel, and resulted in the practical restoration to project dimensions north of the Broadway Bridge.

The project has been completed except as to removing a small shoal below Broadway Bridge and to making such slight changes in the outer end of the dike as to make it less of an obstruction to navigation. A channel has been dredged to a depth of 6 feet at mean low water and 200 feet wide up to Broadway Bridge, except as to the removal of the above-mentioned shoal; thence to Main Street Bridge of the Long Island Railroad Co. 100 feet wide. The whole of the dike is in bad condition, and all of the outer end, 1,606 feet long, with the exception of a few scattering piles and stones, has been carried away by storms and ice. Dike construction was discontinued in 1891. The channel below Main Street Bridge has shoaled to a considerable extent by filling in from the sides.

The maximum draft that could be carried June 30, 1912, from East River to the Broadway Bridge at mean low water is estimated at 6 feet in about mid-channel; thence to the Main Street Bridge about 7 feet. Mean range of tides, 7.1 feet. The head of navigation is about 1 mile above Strong's causeway. The total length of the navigable channel is about 5½ miles, of which about 2½ miles is under improvement.

Commercial statistics of Flushing Bay for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1899	163,395	$1,449,438	1906	273,312	$3,937,444
1900	158,755	1,534,937	1907	232,911	2,537,825
1901	200,473	4,196,406	1908	126,455	1,774,900
1902	186,000	1,613,100	1909	277,300	879,700
1903	110,100	960,750	1910	563,029	1,256,880
1904	142,996	2,599,488	1911	394,328	3,251,548
1905	142,274	2,656,650			

This work has facilitated transportation, but no appreciable effect on freight rates has been ascertained.

A report upon an examination of Flushing Bay and Creek made March 23, 1910, and a map of the locality are contained in House Document No. 1333, Sixty-first Congress, third session.

Amount (estimated) required to be appropriated for completion of existing project	$12, 251. 64
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	20, 000. 00

CHANNEL IN GOWANUS BAY, NEW YORK HARBOR, N. Y.—BAY RIDGE AND RED HOOK CHANNELS.

These channels lie along the east shore of the upper bay, New York Harbor, and with Buttermilk Channel form an easterly channel between the Narrows and East River, separated from the main channel by a broad shoal off Gowanus Bay and by Governors Island.

Bay Ridge and Red Hook Channels had a natural low-water depth of 7 to 12 feet and were available only for a limited harbor commerce.

The original project, adopted in 1881, provided for making these channels 18 feet deep and 200 feet wide; it was subsequently modified to make the depth 26 feet and width of 800 feet in Bay Ridge Channel and 400 feet in Red Hook Channel. This was completed in 1899 at a cost of about $1,090,000.

The existing project was adopted by the river and harbor act of 1899, which provided for making Bay Ridge and Red Hook Channels 40 feet deep at mean low water and 1,200 feet wide. The work was authorized to be done under a continuing contract at a cost not exceeding $2,500,000. Such a contract was entered into in 1899 for excavating about 22,000,000 cubic yards of material and completing the project. Work was begun in 1900 and prosecuted until November, 1906, generally at rates of progress less than required by the original contract. November 24, 1906, the last of the dredges was withdrawn from the work; the plant had been sold by the contractors, and the new owners refused to continue dredging. The contractors failed to resume work when called upon, and the contract was annulled February 20, 1907.

The river and harbor act of March 2, 1907, authorized the prosecution of the improvement of these channels with a view to obtaining, first, a depth of 35 feet, and subsequently the full depth of 40 feet and width of 1,200 feet, in accordance with the project adopted in 1899; and appropriations of 1907 and 1909 were expended in dredging these channels 35 feet deep for a width of 1,200 feet.

Under the appropriations of June 25, 1910, and March 4, 1911, a contract has been entered into for dredging these channels to 40 feet depth as far as the funds will admit. Work was begun in April, 1911, and is in progress. It is expected that this contract, with funds available, will complete rather more than one-half of Bay Ridge Channel to 40 feet depth.

Under the project of 1899, $2,191,922.42 has been expended in dredging 17,547,218 cubic yards of sand and mud, which is about 80 per cent of the amount of excavation originally estimated as necessary to complete the project. Both channels have been dredged 35 feet deep and 1,200 feet wide, except a small section at the edge of Red Hook Channel; both channels have an available depth of 35 feet for nearly 1,200 feet width, and Bay Ridge Channel has a narrow passage of 40 feet depth.

The total length of channel covered by the improvement is 4½ miles; the mean rise of tide is 4½ feet.

During the year ending June 30, 1912, 1,027,596 cubic yards of sand and mud were dredged from Bay Ridge Channel, deepening the east half of the channel to 40 feet.

It is proposed to apply present and future appropriations to deepening Bay Ridge and Red Hook Channels to 40 feet, with width of 1,200 feet, as contemplated in the adopted project. In view of the extent and importance of this improvement it is recommended that a further continuing-contract authorization be made for its completion, or at least for the completion of work on Bay Ridge Channel, this latter part of the project being estimated to cost $1,091,000, or $600,000 in excess of funds heretofore appropriated.

After the failure of the original contract for completion of the present project, it was evident that no prices could be obtained which would permit of completing the whole work within the $2,500,000 authorization of 1899. A new survey was made, and in 1909 a new estimate of cost of completion was submitted, which involved an increase in the estimate of $959,000, making the entire cost for the 1899 project $3,459,000.

The commerce of this part of the port of New York consists of coffee, sugar, cotton, coal, and miscellaneous freights, chiefly from foreign ports.

The commerce of these channels during the calendar year 1911 was about 4,502,000 tons, valued at $232,562,000.

Further details concerning these channels are contained in the Annual Report of the Chief of Engineers for 1899, page 1266.

House Document No. 337, Fifty-fourth Congress, second session, contains a report upon a survey of these channels, with map showing locations and depths as existing in 1897. (See Annual Report of the Chief of Engineers for 1897, p. 1177.)

The effect of the improvement projected is undoubtedly to lower freight rates; these rates depend so largely upon the amount of business in hand and upon competition that it is impracticable to separate the effect of the improvement upon rates. A notable effect has been the growth of foreign commerce and the class of ships which carry it, many of which could not have entered Bay Ridge Channel before its improvement. During the past year two European lines have established themselves at the head of Bay Ridge Channel.

Amount (estimated) required to be appropriated for completion of existing project	$959,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	300,000

HARBOR AT GREAT SODUS BAY, N. Y.

This is a nearly landlocked bay, 27 miles west of Oswego Harbor, 2½ miles long and ½ to 1½ miles wide, with a depth of from 18 to 40 feet, connected with Lake Ontario by a channel 1,800 feet long between and beyond parallel piers. In its original condition this channel was wide and impracticable for vessels drawing over 8 feet.

The original project of 1829 was to narrow the entrance by constructing two converging breakwaters and to secure a channel of 12 feet depth by building two parallel piers about 450 feet apart, connecting with the ends of the breakwater, and by dredging. The present project, of 1882, is to obtain a depth of 15 feet at low water (zero of Oswego gauge) by extending the two piers a total of 1,100 feet and by dredging. After the piers had been extended to their present lengths, the project was modified July 18, 1896, to restore and maintain the channel 150 feet wide between the piers, flaring to 250 feet in the lake, to the requisite depth of 15 feet at low water, by dredging, without further extension of the piers for the present.

The amount expended on original project prior to operations under existing project was $475,646.80.

The existing project is to secure and maintain the channel 15 feet deep at low water for a width of 150 feet between piers flaring to 250 feet in Lake Ontario, without further extension of the piers for the present.

Maintenance will be required indefinitely. The piers are 438 to 473 feet apart; west pier 1,580 feet long, east pier 1,294 feet long, projecting beyond the shore line 1,150 and 1,294 feet, respectively. The west breakwater is 495 feet long and the east breakwater 1,438 feet long. Old timber supstructures have been replaced with concrete; west pier, 810 feet; east pier, 1,022 feet; breakwaters, none. The channel is unstable and required redredging annually.

During the fiscal year the work of replacing the old timber superstructure on piers with concrete was continued, and the channel between the piers was redredged. All work was done by hired labor and United States plant.

The limiting depth June 30, 1912, was 12 feet at low water in a channel width of 140 feet, and the usual variation of level of water surface is 3 feet.

The amount expended to June 30, 1912, was $577,644.85, of which $169,315.05 was for maintenance.

The project is reported to have a material effect in controlling freight rates on bulk commodities, such as coal, grain, lumber, and ore.

The following is a statement of commerce at this port for the past 10 years in short tons: 1902, 26,726; 1903, 18,875; 1904, 30,797; 1905, 46,251; 1906, 58,905; 1907, 78,057; 1908, 73,989; 1909, 34,577; 1910, 37,555; 1911, 55,693.

Work proposed for the fiscal year ending June 30, 1914, is the continuation of replacing old timber pier superstructures with concrete and redredging the channel to restore project depth. The appropriation recommended is for this work, in addition to funds on hand.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$4,000

GREAT SOUTH BAY, N. Y.

The first project, adopted September 19, 1890, provided for the improvement of the Patchogue River, a small inlet extending from Great South Bay, Long Island, to the village of Patchogue. This stream had, before improvement, a width of about 200 to 400 feet and a depth of 2 feet. The project provided for a channel about 5,000 feet long, 60 feet wide, and 6 feet deep, to be protected at its mouth against westerly storms by a jetty 1,700 feet long. Estimated cost, $40,000. On June 30, 1902, there had been expended on this work $40,000, and the project was completed.

The present project, adopted June 13, 1902, provides for dredging a channel from Fire Island Inlet, which connects Great South Bay with the ocean, to Patchogue, on Patchogue River. From the inlet to the central basin in Great South Bay the channel is to be 10 feet deep at mean low water and 200 feet wide. From the central basin to Patchogue the channel is to be 8 feet deep and 100 feet wide at mean low water. The river and harbor act approved June 25, 1910, provided for redredging the channel and the construction of jetties, but omitting the dredging from the inlet to the central basin, increasing the estimate for completion from $66,000 to $141,000, and $2,000 annually for maintenance.

Up to June 30, 1912, $97,829.87 had been expended on the project, of which amount $38,009.05 was for maintenance. There was received during the year, from the sale of maps, $1.45.

About 41 per cent of the work contemplated under the present project has been completed, resulting in a channel 200 feet wide and 10 feet deep at mean low water in the bay, except at bars A and B, and in dredging a channel 100 feet wide and 8 feet deep at mean low water in the river. Considerable shoaling in the latter always occurs after dredging has been done. To maintain the channel at a minimum of cost the present west jetty may have to be extended to at least the 7-foot contour in the bay, and an easterly jetty built out from the shore to the same contour; this matter is now under consideration. Dredging through the bars in the bay is not contemplated for the present.

The maximum draft that could be carried June 30, 1912, over the shoalest part of the channel from Fire Island Inlet to Central Basin is estimated at 8.5 feet, and in Patchogue River at not more than 8 feet.

Mean range of tides, 1 foot. The head of navigation in Patchogue River is at a fixed bridge at Division Street, Patchogue. The total length of navigable channel from Fire Island Inlet to Patchogue is about 17½ miles and to Belleport 22 miles. The length of channel under improvement at Patchogue is about seven-eighths of a mile.

Commercial statistics for Great South Bay for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1898	255,200	$3,702,000	1905	224,526	$3,871,850
1899	266,800	3,808,500	1906	232,500	4,014,000
1900	274,100	3,919,000	1907	224,108	3,903,723
1901	281,300	4,025,600	1908	195,000	3,320,000
1902	257,500	4,000,000	1909	204,500	3,406,000
1903	258,500	3,995,000	1910	181,000	3,220,600
1904	257,879	4,037,130	1911	180,800	3,135,000

As a result of this work, navigation has been aided and commerce correspondingly benefited. So far as can be ascertained no reduction in freight rates has resulted, due, no doubt, to the dangerous condition of Fire Island Inlet.

Amount (estimated) required to be appropriated for completion of existing project	$25,305.45
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	5,000.00

HEMPSTEAD HARBOR, N. Y.

This harbor is situated on the north shore of Long Island, about 29 miles, by water, east of the Battery, New York City. It is divided by a narrow neck of land into an outer and inner harbor. The proposed improvement includes only the latter, which is approximately 2 miles long and one-third of a mile wide, except at its extreme southern end. Originally a channel not less than 6 feet deep at mean low water, with varying widths, extended from the outer harbor to about opposite Ward's Wharf; thence to the head of the harbor the depth gradually diminished to zero at Roslyn Wharf, with no well-defined width, above which the bottom of the harbor was exposed at low water.

The existing project, adopted by the river and harbor act of June 25, 1910, provides for a channel 6 feet deep at mean low water and 100 feet wide from the entrance to the head of the natural deep basin about opposite Ward's Wharf; thence 80 feet wide to the town wharf at Roslyn; and thence to the head of navigation 50 to 70 feet wide, in accordance with plan printed in Rivers and Harbors Committee Document No. 1, Sixty-first Congress, second session, at an estimated cost of $47,000, and $3,000 annually for maintenance. Being a new channel, the estimate for maintenance will probably have to be increased for the first year owing to the excessive refill from the adjacent mud flats.

The river and harbor acts of June 25, 1910, and February 27, 1911, made appropriations of $47,000 for completing the improvement and provided that no part of this sum should be expended upon the channel above the town wharf until a suitable dumping ground for the material dredged had been furnished by the local interests, free of cost of the United States.

The amount expended to June 30, 1912, was $21,868.94.

During the year 87,187 cubic yards of material were removed from the channel, extending it to a point 500 feet south of the Roslyn town wharf. Of this amount 70,039 cubic yards were removed under a former contract and 17,148 cubic yards under the existing contract. Total length of channel made during the year, 2,400 feet; partially completed, 500 feet. The project is about 63 per cent completed.

The maximum draft that could be carried from the entrance to about 500 feet south of Ward's wharf is about 6 feet; thence the depth gradually diminishes to the head of the harbor, where the bottom is exposed at low water. Mean range of tides, 7.7 feet. The length of navigable channel from the entrance is about 2 miles. The head of navigation is at a dam at Hicks's lumber yard in Roslyn.

Commercial statistics for Hempstead Harbor for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1909	1,840,219	$1,610,739.95	1911	844,480	$614,333.50
1910	1,913,839	1,675,173.34			

July 1, 1912, amount covered by uncompleted contracts	$9,159.75
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	5,000.00

HUNTINGTON HARBOR.

This harbor is a landlocked arm of Huntington Bay, about 2 miles long and one-fourth of a mile wide, situated on the north shore of Long Island about 40 miles east of New York City. It extends in a generally southerly direction from Huntington Bay, from which it is separated by a beach of sand and gravel, through the western end of which a narrow inlet connects the harbor and bay.

Before improvement it had a natural available depth of nearly 8 feet, mean low water, for a stretch of 1¼ miles from the entrance southward, thence gradually decreasing to zero toward the head of the harbor. Width at entrance about 150 feet.

In 1872 the first project was adopted, under which, in 1873, a shoal at the harbor entrance was removed and a channel 2,200 feet long, 130 to 150 feet wide, and 8 feet deep at mean low water was dredged up to the town landings at a total cost of $22,500. In 1884 this channel had completely filled up.

The present project, adopted September 19, 1890, provides for dredging and maintaining a channel 8 feet deep at mean low water and 100 feet wide up to the upper wharves, to be protected by piling, if necessary. Estimated cost, $32,000.

Up to June 30, 1912, $40,274.24 had been expended on this project; of this amount $10,785.18 was for maintenance.

During the year 7,500 cubic yards of material were removed from near the head of the harbor. Length of channel redredged, 1,700 linear feet. All for maintenance.

The project is completed, except as to pile construction necessary to maintain the channel. For purposes of maintenance the channel has been dredged 200 feet wide in lieu of pile protection. The dredged channel has deteriorated to a considerable extent in the vicinity of the upper wharves; below this there is a fair channel with minimum depth of about 7 feet and approximate width of 100 feet.

The maximum draft that could be carried June 30, 1912, over the shoalest part of the improved channel is estimated at about 8 feet at mean low water to the upper wharves.

Commercial statistics for Huntington Harbor for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1897	23,584	$473,109	1906	105.212	$2,774,850
1899	46,500	605,000	1907	96,196	1,901.061
1900	45,600	768,000	1908	38.316	413.218
1901	52,000	875,800	1909	43,289	476,414
1903	66.000	1,086,000	1911	50.542	548,072
1904	94,950	2,818.250			

This improvement has resulted in a material reduction in freight rates.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement $5,000.00

JAMAICA BAY, N. Y.

This bay lies wholly within the limits of New York City in the south shore of Long Island, N. Y. It is approximately 8 miles long and 4 miles wide, and covers an area of about 32 square miles. It is connected with the ocean at Rockaway Inlet by a shifting channel having a least depth over the bar of about 13 feet at mean low water when surveyed in 1908, increasing to about 50 feet inside of Rockaway Point. Low lying hummocks in the bay and bounding marshes reduce the water area to about 25 square miles. Numerous channels, varying both in width and depth, pass between the hummocks and along the shores of the bay, some of which are not navigable at ordinary low water.

In the river and harbor act approved June 25, 1910, Congress adopted a project for improvement in accordance with the report submitted in House Document No. 1488, Sixtieth Congress, second session, and appropriated $250,500 for the work, with the proviso that no part of this amount shall be expended until the Secretary of War is satisfied that the city of New York is prepared to undertake its part of the general plan for the improvement of Jamaica Bay as outlined in the report cited above.

In this project the United States and the city of New York propose to enter into a general plan of improvement of Jamaica Bay, the dredging and maintenance of an entrance channel to be undertaken by the United States; dredging of the interior channel by the city of New York, to be reimbursed to a specified amount by the United States; and bulkheading the shores of the bay and filling behind bulkheads by the city of New York.

It is proposed that the General Government provide the main waterway and the city the auxiliary waterways, bulkheads, fills, and basins. The main waterway as defined above is of two parts—(*a*) an entrance channel between the deep water of the ocean and the southeast corner of Barren Island and (*b*) a main (interior) channel lying at the inner end of the entrance channel and terminating at the mouth of Cornells Creek. Under this arrangement the United States is to open and maintain the channel of entrance, and the city of New York is to dredge the main interior channel and "be reimbursed therefor at the rate of 8 cents per cubic yard, place measurement, for all material dredged within the limits of the main channel to the extent only of $4,720,000, less cost to the Government of superintendence, surveying, and inspecting."

The main waterway, as projected, is to have ultimately a depth of 30 feet, with a width of 1,500 feet in the entrance channel and a width of 1,000 feet in the main channel. The channels are to be opened and maintained by dredging and by the construction of jetties at the entrance to the bay, if necessary. The total ultimate cost to the United States for the improvement should not exceed $7,430,050, plus the cost of maintaining the entrance channel.

It is proposed first to open and maintain an entrance channel 18 feet deep and 500 feet wide, at an estimated cost of $250,500. It is proposed, further, that "the city shall not be reimbursed for excavating any material from the main channel below the depth of 18 feet until the United States has undertaken to increase the depth of the entrance channel beyond 18 feet."

In the river and harbor act of 1910 Congress appropriated the amount estimated for opening the 18-foot entrance channel, $250,500, with provision that it should not be expended until the city of New York should take certain definite action to the satisfaction of the Secretary of War. To meet this condition the city of New York has appropriated $1,000,000 toward its part of the proposed work, to be applied by the department of docks and ferries, as follows: For construction of a bulkhead or wall, $50,000; for dredging in the main channel of Jamaica Bay, contingent upon provision for reimbursement by the United States for all or part of the cost of said dredging, $150,000; for acquiring lands needed for filling purposes, $750,000; the application of the other $50,000 being otherwise provided for. This action has been accepted by the Secretary of War as satisfactory, and arrangements have been made to begin excavation of the entrance channel with the New York Harbor dredges.

The river and harbor act approved July 25, 1912, made an appropriation of $300,000 for beginning excavation of the channels within the bay, specifying that—

> from which amount the Secretary of War may reimburse the city of New York each month for the dredging and the disposition of dredged material of the preceding month at the actual unit price per cubic yard, place measurement: *Provided*, That such cost does not exceed 8 cents per cubic yard.

An examination of the bar and channel at the entrance, made in the winter of 1911–12, showed that the westward progress of Rockaway Point and of the channel had continued since the survey of 1908 to a total amount of 700 feet. Actual dredging had been deferred for a new layout of the channel based on the new examination and for removal of trans-Atlantic cables which cross the channel. Dredging is to begin at once.

The maximum draft that could be carried through the inlet on June 30, 1912, at mean low water is estimated at 13 feet, reducing to less than 1 foot at the head of the bay. The mean range of tides varies in different localities from 4.8 feet to 5.1 feet. The head of navigation in the bay is at Nortons Point, about 11 miles from the entrance at Rockaway Inlet; a number of narrow tidal creeks enter the bay from the east and north.

Disbursements during the past fiscal year, $2,090.64, were in part payment of office expenses; the total expenditure to June 30, 1912, is $2,606.81.

Commercial statistics for Jamaica Bay for the last three years are reported as follows:

Year.	Short tons.	Value.
1909	977,266	$3,846,574
1910	1,785,605	4,631,348
1911	957,271	1,923,118

The amount required for the fiscal year ending June 30, 1914, depends largely upon progress made by the city of New York upon the interior improvement; it is estimated that this may be about $300,000. No additional funds will be required for the entrance channel during that year.

Detailed description of this improvement and map of the bay are printed in House Documents Nos. 1488 and 1506, Sixtieth Congress, second session.

July 1, 1911, balance unexpended	$249,994.68
Received from sale of maps	28.26
	250,022.94
June 30, 1912, amount expended during fiscal year for works of improvement	2,090.64
July 1, 1912, balance unexpended	247,932.30
Amount appropriated by river and harbor act approved July 25, 1912	300,000.00
Amount available for fiscal year ending June 30, 1913	547,932.30
Amount (estimated) required to be appropriated for completion of existing project	6,879,550.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 300,000.00

MATTITUCK HARBOR, N. Y.

This harbor is a tidal inlet on the north side of Long Island, about 70 miles east of New York City, extending in a southerly direction from Long Island Sound to the village of Mattituck. Originally a milldam and fixed bridge obstructed the creek about 1 mile above its mouth. Before improvement the entrance was obstructed by a shifting sand bar, rising to within from 1 to 2 feet below mean low-water plane; thence up to the milldam the depth was from 2 to 7 feet at low tide, and above the latter 6 feet at high tide. The width of the stream was about 150 feet.

The existing project, adopted June 3, 1896, provides for a channel 7 feet deep at mean low water from the entrance to the dam and 7 feet deep at mean high water above the dam to the village, the width to be 80 feet, except near the mouth, where it is increased to 100 feet; the entrance channel to be protected by two jetties. In 1910 Congress made the improvement above the site of the bridge and dam conditional on the substitution of a drawbridge for the fixed bridge and the removal of the dam by the local authorities. Estimated cost to the milldam, $134,200.

In November, 1910, a severe storm from the sound caused a heavy wash of water between the jetties and over the easterly one and resulted in the undermining and destruction of about 18 feet of the fence dike at the south end of the westerly jetty. Similar storms later on destroyed about 42 feet more immediately south of the former break.

Up to June 30, 1912, $82,903.25 had been expended on the project; of this amount $7,116.79 was for maintenance.

No construction work was done during the year, due to the fact that an easement or right of way for a shore extension of the east jetty could not be procured from the owner of the uplands. Repeated attempts were made by this office and by the local interests, but so far have been unavailing; they are still in progress. The proposed jetty work, it is believed, would tend to reduce the size of a shoal at the entrance, which always forms soon after dredging. Money spent in dredging without any hope of holding the channel entrance seems unadvisable.

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[1] Exclusive of amount available for fiscal year 1913.

About 56 per cent of the work proposed under the project has been completed, resulting in building the west jetty to full projected section for a length of 680 feet and the east jetty to full projected section for a length of 775 feet, connecting the west jetty with the shore above high water by a dike 371.1 feet long, and in dredging a channel 7 feet deep at mean low water and 100 feet wide for a distance of about 1,400 feet from the entrance; thence a distance of about 400 feet, the same depth and 80 feet wide; and thence to the milldam the same depth and 60 feet wide. Considerable shoaling has occurred in the entrance channel and about 195 linear feet of the outer end of the west jetty and 95 linear feet of the east jetty have yet to be repaired and made sand tight.

The maximum draft that could be carried June 30, 1912, in the entrance is about 3 feet; thence to the dam 7 feet. Above the milldam the least depth is about 6 feet at mean high water. The head of navigation is at the village of Mattituck. The total length of navigable channel from Long Island Sound to the milldam is about 1 mile; thence to Mattituck about 1½ miles. The mean range of tides outside the entrance is 4.8 feet; below the milldam, which before dredging in the entrance was 2.2 feet, is now 4.4 feet.

The harbor is now used as an anchorage by a number of oyster vessels, and the construction of a wharf, oyster sheds, and a slip for handling cargoes has been commenced.

Based only upon the present amount of commerce using the creek, it would appear doubtful whether the improvement should be extended to the village of Mattituck. By the river and harbor act approved June 25, 1910, the dredging of a channel above the dam to the village was made conditional upon the replacing of the fixed bridge by a suitable drawbridge and removal of the dam by the local authorities. In order to meet this requirement and with a view of securing a channel to the village as originally projected, the local authorities have, under a permit granted by the Secretary of War, completed the construction of a drawbridge, and it is reported that the old dam has been removed. The effect of this work upon the waterway above the bridge will prove detrimental rather than helpful to the village of Mattituck unless a channel be now made to the village as originally projected. This is the only harbor in a length of 48 miles of coast on the north shore of Long Island that can be safely entered by fishing vessels. It lies about midway between Port Jefferson Harbor on the west and the Plum Gut entrance to Gardiners Bay on the east.

To make such a channel will require the expenditure of $42,500, in addition to the estimate of $134,200 for completing the project to the milldam, or a total of $176,700 for completing the project to the village.

A survey of the creek from its mouth to the village of Mattituck was made for the purpose of making an estimate for dredging.

Amount (estimated) required to be appropriated for completion of existing project	$24,350
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	10,000

NEW YORK HARBOR, N. Y.

There are at present two channels of approach to New York Harbor, the Main Ship-Bayside-Gedney Channel and the new Ambrose Channel.

Main Ship-Bayside-Gedney Channel.—Before improvement by the United States this channel carried a depth of 23.7 feet across the outer bar at mean low water, and about the same depth across three other shoals between the bar and deep water in the harbor. A large proportion of the commerce of the port, carried in vessels of greater draft, could cross these shoals only at or near high water.

The project for the improvement of the outer portion of this channel, known as Gedney Channel, was approved by the Secretary of War December, 1884, under the provision of the river and harbor act of 1884, and in 1886 was extended to cover the whole of the main entrance. It provided for dredging a channel 30 feet deep at mean low water and 1,000 feet wide between the sea and deep water at the Narrows. The estimated cost was $1,490,000 for dredging 4,300,000 cubic yards. The work was substantially completed in October, 1891, by the dredging of 4,875,079 cubic yards.

The maintenance of this route has been carried on under a project approved November 15, 1892, under the provision of the river and harbor act of July 13, 1892. The total expended in maintenance for the period of 20 years since completion of project in 1892 is $815,898.64. The cost has been increasing from year to year, and the present estimated amount required for maintaining the channel to full width and depth is $100,000 per year. It would not have been below this for several years if the channel had been kept its full width of 1,000 feet. The amount expended in original excavation was $1,518,024.52.

These expenditures have resulted in maintaining a channel 30 feet deep at mean low water for a width of 1,000 feet or over, except on the Main Ship Channel, where the width has varied from 600 to 800 feet.

The near completion of Ambrose Channel renders it much less necessary to maintain these channels to the full projected width and depth. No work upon them has been required for the benefit of navigation during the past year, and none has been done.

The project was further extended by the river and harbor act of June 25, 1910, to include the maintenance of Ambrose Channel under the terms of the river and harbor act which appropriated $200,000 for "improving New York Harbor, N. Y., for maintenance, including Ambrose Channel."

Ambrose Channel.—Ambrose Channel (formerly known as East Channel) had an original available depth of 16 feet at mean low water and was used only by towboats, scows, and very light-draft vessels. By the terms of the river and harbor act of 1899 a project was adopted for making an entrance to New York Harbor by this channel, to be 2,000 feet wide and 40 feet deep at mean low water. It involved an estimated excavation of about 42,500,000 cubic yards of material for a length of 7 miles of channel. The work was authorized to be done under a continuing contract, at a cost not exceeding $4,000,000. Under the act of March 3, 1903, two United States dredges were built to supplement the contract work, which was far behind the required rates. In October, 1906, the contractor abandoned the work, and the river and harbor act of 1907 authorized the building of two more United States dredges, at the same time changing the authorized limit of expenditure to $5,148,510. The sundry civil act of June 25, 1910, appropriated $324,510 for this work, which, with prior appropriations, makes up the authorized limit, and which will suffice to complete the construction of the channel.

To June 30, 1912, $5,089,237.68 has been expended in building four dredges and in excavating 61,586,673 cubic yards of sand, mud, and stones.

During the fiscal year ending June 30, 1912, two of the United States dredges built for this work were engaged upon it continuously, except when at work upon Coney Island Channel; the other two were leased to other Government channel improvements. The amount of excavation for this channel during the past year was 3,717,742 cubic yards.

Ambrose Channel now has a depth of 40 feet at mean low water with widths from 1,850 to 2,000 feet throughout its entire length, excepting a few shoal spots where soundings show occasional depths between 39 and 40 feet. The channel is easily navigable at mean low tide for ships of 37 feet draft going at moderate speed and has a maximum high-water capacity of 44 feet. The project is regarded as about 96 per cent completed.

This channel was first buoyed for navigation in September, 1907, and regulations were issued by the Secretary of War, under authority of law, restricting its use to daylight navigation by ships of 29 feet draft or over, or of 600 feet length or over. As the improvements progressed it became practicable to remove most of this restriction, and under authority of act of Congress of March 3, 1909, regulations were issued permitting use of the channel by day or night by all steamships or steamers not having tows, regardless of size.

Ambrose Channel is at present safely navigated by steam vessels not only during daylight as formerly but at nights and even in foggy weather. Until within the past three years no vessels attempted to come in at night. At present they come in at all hours of the night and some steamers come in in heavy fog. That such vessels may navigate the channel in safety there should be no other vessels in the course which are not under control.

It would be greatly to the advantage of navigation if the regulations restricting the use of this channel, issued by the Secretary of War March 12, 1909, under authority of section 5 of the river and harbor act of 1909 which authorized such regulations "during the further progress of dredging Ambrose Channel," could be made permanent.

It is therefore recommended by the Chief of Engineers that the following be enacted:

> That the Secretary of War be, and is hereby, authorized to make such rules and regulations for the navigation of Ambrose Channel after completion as to him shall seem necessary or expedient to insure its safe use in all kinds of weather, night and day, for all vessels under control and running under their own power; and to this end may, in his discretion, forbid its use to tows of every description and to sailing vessels.

Removal of submerged reef in North River, near Pier A, Manhattan.—This reef, with an original depth of 28.8 feet, was wholly removed to 40 feet depth, funds from Ambrose Channel appropriations being applied to the work in accordance with acts of Congress of July 1, 1902, and March 3, 1905. The work was completed in December, 1909, at a total expenditure of $43,979.12, out of which $2,500 was recovered from sureties on a failing contract, making the total net cost to the United States $41,479.12.

Maintenance.—Under the terms of the river and harbor act of June 25, 1910, the maintenance of Main Ship-Bayside-Gedney Channel and of other channels included in the former project was consolidated with that of Ambrose Channel. After the completion of Ambrose Channel excavation the maintenance of these several channels will be continued in order of necessity and importance. As nearly as can be now estimated, the cost of this work will be $200,000 per annum.

The length of the part of New York Harbor included within the limits of the project (from Atlantic Ocean to the Battery, New York City) is 22½ miles. The dredging has extended over 15 miles of this route, including Ambrose Channel. The mean rise of tide is 4½ feet.

Anchorage grounds in the upper bay.—These anchorage grounds were laid out about 1898 under anthority of an act of Congress, approved May 16, 1888 (25 Stats. L., p. 151), as amended and extended by act approved March 3, 1899 (30 Stats. L., p. 1091). They included shoal-water areas for the use of light-draft vessels and deep-water areas for the accommodation of deep seagoing vessels. The deep-water anchorages were located on the west side of the channel from the southern point of Staten Island to the mouth of the Hudson River in the upper bay. Necessarily they encroached more or less upon the deep-water fairway, but there was still room enough between the outside line of these anchorages and the shoal water on the opposite side for easy navigation up and down the bay by the largest vessels in existence at that time. Since then vessels have been rapidly increasing in size and draft, and complaint has recently been made that the larger vessels now coming to this harbor having a draft of 35 feet or over and requiring a depth of 40 feet for good steering are sometimes crowded to the eastward upon water too shoal for them by the vessels swinging at anchor within the established anchorage grounds.

The complaint has been investigated and found to be well founded; the facts have been presented to the Department of Commerce and Labor, and temporary relief has been obtained by the discontinuance of the anchorage area at the most contracted point abreast of Robbins Reef in the lower portion of the upper bay. This relief, however, has been obtained only at the sacrifice of much-needed anchorage ground and should be regarded as only a necessary and urgent expedient pending the approval by Congress of a project for improving the upper bay so as to remove all causes for complaint.

Two plans have been considered—one for leaving the anchorage grounds where they are and excavating a deep-water channel 2,000 feet wide and 40 feet deep east of them, at a cost of about $740,000; the other for transferring the anchorage grounds to the shoal on the east side of the natural channel, excavating the shoal to the needed depth, and providing a main fairway along the route where the present anchorages are located for a full width of 2,000 feet and a depth of 40 feet, at a cost of about $473,000. The initial appropriation for this work should be at least $250,000.

The first plan mentioned is favored by the steamship companies, whose views have been asked, as being the one most advantageous for the needs of this great harbor, and is recommended by the district officer, the division engineer, the Board of Engineers for Rivers and Harbors, and by the Chief of Engineers.

Commercial statistics.—The foreign exports and imports for the port of New York during the year ending June 30, 1911, amounted approximately to 13,581,200 short tons, valued at $1,744,877,134, being an increase over the valuation of 1886, before improvement of the harbor entrance was begun, of $904,600,442. The entire cost of this improvement up to this date is about seven-eighths of 1 per cent of the increase in valuation of annual foreign commerce alone for this port since the improvement was begun, and is less than one-half of 1 per cent of the present annual value of foreign commerce.

No detailed statistics of domestic and local commerce are kept.

Recent compilations from reliable sources indicate an approximate annual tonnage for the port of New York of somewhat over 90,000,000 tons.

It is impossible to estimate the effect of the improvement upon freight rates. During 1911, 167 different ships, with drafts of 27 feet or more, made 773 trips outward and 248 trips inward. Prior to the improvement none of these ships could have crossed the bar to enter or leave the harbor except at extreme high tide or after lightering.

Further details of the harbor and improvements are printed in the Annual Report of the Chief of Engineers for 1897, page 1031.

A general description of the harbor, of the different channels, of the main entrance, and of the projects for improvement is printed in the Annual Report of the Chief of Engineers for 1901, pages 1285–1287. A map of the harbor is printed in the Annual Report for 1903, page 914.

Maintenance, including Ambrose Channel.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$200,000

Following is the report of the Board of Engineers on a recent survey, printed in House Document No. 719, Sixty-second Congress, second session:

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, April 1, 1912.

Respectfully returned to the Chief of Engineers, United States Army.

In his report on survey the district officer, who is also division engineer, presents a plan for deepening the North or Hudson River in the vicinity of New York City by dredging a channel 800 feet wide and 30 feet deep from deep water off Ellis Island to Newark Street, Hoboken; the irregular-shaped shoal off Hamburg Avenue to a depth of 40 feet; a channel 550 feet wide and 26 feet deep along Weehawken-Edgewater water front; removing an irregular-shaped shoal on the east side of the river between Nineteenth and Thirty-second Streets to a depth of 40 feet; removing a small rock near the Battery; and a small obstruction near Spuyten Duyvil Creek, as shown on accompanying maps, at a total estimated cost of $1,570,000. No estimate for maintenance is given, as the amount required can be determined only from experience.

The district officer states that during recent years there has been a very large increase in the commerce on the New Jersey water front, the total amount now being over 31,000,000 tons annually. From a table given, it appears that there were more than 1,000 vessels entering and departing having a draft of 27 feet and over, up to 37 feet. The opinion is expressed that the commerce of New York Harbor has grown to such volume and the congestion of the traffic in the deep-water channel of the Hudson River is so great that relief must be afforded at the earliest practicable date. The improvement outlined above is deemed adequate to meet present and reasonably prospective requirements.

In view of the magnitude of the interests involved and of the necessity of furnishing adequate channel dimensions to keep pace with the increasing number and size of vessels and the amount of commerce handled in this vicinity, the board believes that further improvement is justified. The cost of the work proposed by the district officer is not deemed excessive when compared with the interests to be affected, and, therefore, the board reports that, in its opinion, it is advisable for the General Government to undertake the work as outlined above and given more in detail within.

The district officer states that to secure the most economical results in making these channels there should be sufficient funds appropriated to secure through channels of at least 200 feet in width without interruption to the work. This he estimates would cost $450,000. This initial work might cover a period of two years. It is, therefore, recommended that the first appropriation be $200,000, with contract authorization for $250,000 additional, and that further appropriations be made with a view to the completion of the project in about five years.

In compliance with law the board reports that there are no questions of water power, terminal facilities, or other related subjects which could be advantageously coordinated with the improvement proposed to lessen the cost thereof and compensate the Government for expenditures made in the interest of commerce and navigation.

The Chief of Engineers concurs generally in the above.

HARBOR AT OGDENSBURG, N. Y.

On St. Lawrence River, 62 miles from Lake Ontario. It consists of dredged channels 100 to 600 feet wide, present depth 14 to 21 feet, to and along a river wharf frontage of 2 miles. In its original condition the low-water depth of this harbor was 9 feet in the upper entrance channel leading to the Oswegatchie River, 10 to 12 feet in the two lower entrance channels, and 6 to 12 feet along the city front.

The original project of 1868 was to dredge the channels to and along wharves to the depth of 12 feet and to build, if necessary, 5,500 linear feet piers at an estimated cost of $100,000. The piers were never built.

The amount expended on original project, prior to operations under existing project, was $401,875.97.

The present project, adopted by the river and harbor act of June 25, 1910, is to deepen the several channels of the harbor to 19 feet below the zero of the Ogdensburg gauge (low water, 243.23 feet above mean tide at New York City), and to remove wholly the middle ground between the two lower entrance channels to the same depth, at an estimated cost of $187,970, in accordance with report printed in House Document No. 920, Sixtieth Congress, first session.

During the fiscal year dredging of all channels under contract was under way and will be completed in 1913.

The amount expended to June 30, 1912, was $440,533.73, of which $130,512.32 was for maintenance, and $38,657.76 on existing project.

The maximum draft that could be carried over the improvement at low water (zero of new Ogdensburg gauge corresponding to zero of Oswego gauge) June 30, 1912, was as follows: In the lower entrance channels and channel between them, 19 feet; city front channels, below Caroline Street, 19 to 15 feet, above Caroline Street, 14 feet; upper entrance channel and in mouth of Oswegatchie, 15 feet. The usual variation of level of water surface is 3 feet.

The project probably has a material effect in controlling freight rates on bulk commodities, such as coal, grain, lumber, and ore.

The following is a statement of commerce at this port for the past 10 years, in short tons: 1902, 837,025; 1903, 1,185,785; 1904, 898,257; 1905, 1,034,085; 1906, 1,056,100; 1907, 1,238,498; 1908, 856,714; 1909, 1,049,985; 1910, 1,004,317; 1911, 799,587.

Reference to reports on examination and survey made in compliance with act of March 2, 1907, will be found on page 779 of report for 1908, printed in House Document No. 920, Sixtieth Congress, first session.

Work proposed for the fiscal year ending June 30, 1914, is the removal of the middle ground between the lower entrance channels, and it is recommended that $37,970 be appropriated for work during that year. Balance of funds on hand will be required for maintenance.

Amount (estimated) required to be appropriated for completion of existing project	$67,970
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	37,970

OLCOTT HARBOR, N. Y

The following letter of the Chief of Engineers is from report on a recent examination printed in House Document No. 780, Sixty-second Congress, second session:

War Department,
Office of the Chief of Engineers,
Washington, May 28, 1912.

Sir: I have the honor to submit herewith, for transmission to Congress, reports dated March 28, 1911, by Capt. W. L. Guthrie, Corps of Engineers, and January 16, 1912, with map, by Lieut. Col. J. G. Warren, Corps of Engineers, on preliminary examination and survey, respectively, of Olcott Harbor, N. Y., with a view to securing increased depth, authorized by the river and harbor act approved June 25, 1910.

Olcott Harbor is on Lake Ontario, at the mouth of Eighteenmile Creek, 18 miles east of the mouth of Niagara River, and has been under improvement by the United States since 1867. A channel protected at its outer end by parallel piers has been dredged to project depth, 13½ feet, from deep water in the lake up to Main Street Bridge. The piers are now in need of extensive repairs and considerable shoaling has taken place in the channel. The district officer submits an estimate for restoring the channel to project dimensions and for the maintenance of the piers for five years, but does not recommend the expenditure of the amount required to do this.

It appears that there is at this time practically no commerce in freight at this locality, but that there is a large passenger business handled by the Buffalo, Lockport & Rochester Transit Co., to whom a permit for the use of the east pier was issued by this department under date of December 12, 1911, subject to the condition, among others, that the company should maintain the said east pier and the channel at its own expense. The company has not, however, expressed a willingness to accept the permit if subject to this condition.

The district officer states that a channel 140 feet wide and about 14 feet deep at mean lake level, extending to the inner ends of the existing piers, which he estimates would cost $3,000, is sufficient for the present needs of commerce. In his opinion the Buffalo, Lockport & Rochester Transit Co., being the principal beneficiary of this improvement, should bear one-half its estimated cost and should also maintain the east pier and the channel at its own expense, as required by the permit for the use of the pier. Such an improvement would carry with it the necessity of maintaining the west pier, which the district officer estimates would cost $2,500 for a period of five years, making the required outlay on the part of the United States $4,000. Subject to these provisions the district officer recommends the improvement of this locality to the extent proposed. The division engineer expresses the opinion that a permit to occupy the United States east pier for terminal purposes should be accompanied by a proviso requiring the company so using it to keep the pier in repair and maintain by dredging the channel in front of the property occupied. He believes that maintenance of the west pier by the General Government at an estimated cost of $2,500 for a period of five years is justified.

This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated April 1, 1912. The board has held a public hearing on the subject in this city, and after careful review of all the information presented concurs with the district officer in recommending the improvement proposed, subject to the conditions recommended.

After due consideration of the above-mentioned reports, I concur in general with the views of the district officer and the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of Olcott Harbor, N. Y., is deemed advisable so far as to secure an available channel depth of 14 feet at mean lake level and a width of 140 feet to the inner ends of the existing piers at an estimated cost of $3,000 for first construction, and the maintenance of the west pier for a period of 5 years at an estimated cost of $2,500, provided the Buffalo, Lockport & Rochester Transit Co. shall, subsequent to the date of this report, contribute the sum of $1,500 toward the excavation of the channel, that the company will agree to maintain without expense to the United States the portion of the channel adjacent to the part of the pier occupied by them, and will agree to repair any damages to the east pier done by them or on account of their occupancy of the pier. These estimates are based on the supposition that the work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of the entire cost to the United States, viz, $4,000.

Very respectfully,

EDW. BURR,
Acting Chief of Engineers.

The SECRETARY OF WAR.

The use of the harbor is shown by the following compilation of commercial statistics, from annual reports of the Chief of Engineers and from special reports obtained from the collectors of customs, Niagara Falls district:

Calendar year.	Number of vessels entered and cleared.	Greatest draft of vessels.	Net registered tonnage of vessels.	Freight received.	Number of passengers arrived and departed.
		Feet.		*Short tons.*	
1902	29	7½	4,825	477	10,000
1903	43	10	13,617	1,760	5,000
1904	70	9	25,035	....	5,000
1905	101	9	30,168	329	10,000
1906	84	9	23,030	500	(1)
1907	92	(1)	29,616	....	(1)
1908	64	(1)	14,930	225	(1)
1909	139	(1)	47,958	....	5,000
1910	90	(1)	33,570	....	20,000
1911	204	10	68,784	....	55,000

[1] No record.

No shipments of freight, except a few tons of fruit and passengers' baggage.

The freight traffic consists principally of pulp wood and lumber. It has been irregular, as shown in the tabulation and has been carried on to the extent shown by the two wood-pulp interests, The United Indurated Fibre Co. and United Boxboard Co., at Lockport, N. Y., 12 miles inland from Olcott. The freight is brought to Lockport by electric car line, being transferred from vessel to cars at the International Railway Co.'s frontage beyond the inner end of the United States east pier.

HARBOR AT OSWEGO, N. Y.

This harbor, 59 miles east of Charlotte Harbor, comprises the lower part of Oswego River, a cove at its mouth, protected by a breakwater now known as the inner breakwater, and an outer harbor in Lake Ontario formed by an outer breakwater.

The outer harbor is 5,000 feet long and 600 feet wide, 9 to 16 feet deep; the inner harbor or cove, 1,000 feet long and 200 feet wide, 15 feet deep; the Oswego River for a distance of 2,200 feet from its mouth, 350 feet wide, 8 to 15 feet deep; the entrance channel around east end of outer breakwater, 1,000 feet long and 600 feet wide, 19 to 22 feet deep. In its original condition the harbor in the Oswego River was navigable by vessels of light draft only, and the cove at its mouth had no protection against the lake seas.

The original project of 1827 (completed in 1829) was to build across the cove a breakwater of timber cribs filled with stone. Between 1830 and 1838 a superstructure of masonry was built on 500 feet of this breakwater. Between 1866 and 1869, $41,000 was expended in dredging the harbor to the depth of 12 feet at extreme low water. Between 1868 and 1870 a lighthouse pier was built, extending north 437 feet from the channel end of the breakwater. In 1870 the project for an outer harbor formed by an outer breakwater was adopted, and in 1881 the outer breakwater was completed, having a lake face 4,870 feet lang, a westerly shore return 916 feet long, and an easterly return of 246 feet long. In 1881 a modification was adopted to build an east breakwater, 248 feet of which was constructed in 1881 (removed in 1889) under further modification of project in 1883. Two spurs to the outer breakwater, 100 and 150 feet long, respectively, were built in 1885 and 1889.

In the acts of March 3, 1893, and August 18, 1894, special provisions were made for extending the deep-water area of the harbor in the mouth of the Oswego River by the removal of rock.

Further revision of project was adopted June 3, 1896, based on a special report printed in the Annual Report of the Chief of Engineers for 1895, page 3213 et seq., and subsequently modified in 1897 and 1899.

These modifications provided: First, to build an east breakwater 1,435 feet long, at an estimated cost of $197,000 (acts of Mar. 3, 1895, and June 3, 1896); second, to narrow the breach made in the outer breakwater in 1884 from 175 to about 75 feet, at an estimated cost of $18,500; third, to widen and deepen the inner harbor in the mouth of the Oswego River and to extend the deep-water area farther upstream by rock excavation.

The amount expended on the original project and the above-noted modifications amounted in 1905 to $2,023,612.87.

The advisability of adopting a plan of permanent repair of the outer breakwater was the subject of a preliminary examination with estimate of cost, report printed in Annual Report of the Chief of Engineers for 1904, page 3368 et seq., and House Document No. 55, Fifty-eighth Congress, second session.

The river and harbor act of March 3, 1905, made an appropriation for continuing repairs under the method noted in the report as plan (*b*).

The river and harbor act of March 2, 1907, authorized and began making appropriations for the permanent repair of the outer breakwater under plan (*a*) in the above-mentioned House document, at an estimated cost of $900,000.

The existing project is therefore fundamentally the project of 1870, including the original project and the numerous modifications to date.

The uncompleted items are: (1) To build an east breakwater 1,435 feet long; (2) to narrow the breach in the outer breakwater from 175 to about 75 feet; (3) to widen and deepen the inner harbor in the mouth of the Oswego River and to extend the deep-water area farther upstream by rock excavation; (4) to permanently repair the outer breakwater under plan (*a*); (5) maintenance of the inner breakwater and lighthouse pier, 1,430 and 564 feet long, respectively; (6) maintenance of the entrance channel and outer harbor basin to depth of 15.7 feet and inner harbor to 15 feet at low water (zero Oswego gauge). Items (1) and (3) are not considered necessary or advisable under existing conditions of commerce; items (2) and (4) are in progress; items (5) and (6) will be required indefinitely.

The amount expended for all work to June 30, 1912, was $2,467,199.04. It is impracticable to separate the cost of construction and maintenance.

June 30, 1912, the minimum depth at low water over the shoalest part of the locality under improvement was 14 feet.

The usual variation of level of water surface is 3 feet.

The project is reported to have a material effect in controlling freight rates on bulk commodities, such as coal, grain, lumber, and ore.

The following is a statement of the commerce of this harbor for the past 10 years, in short tons: 1902, 234,009; 1903, 733,734; 1904, 712,481; 1905, 724,502; 1906, 615,840; 1907, 728,090; 1908, 724,187; 1909, 669,387; 1910, 751,363; 1911, 869,965.

Amount (estimated) required to be appropriated for completion of existing project	$415,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	110,000

HARBOR AT PLATTSBURG, N. Y.

The harbor of Plattsburg, N. Y., is located on the westerly shore of Cumberland Bay, 30 miles southerly from the lower end of Lake Champlain at the international boundary, near Rouse Point, N. Y. Cumberland Bay opens toward the southeast, and Plattsburg Harbor in its original condition was exposed to southeasterly storms. The portion of the harbor now used as such is about 1,500 feet long, varies in width from about 500 feet to about 1,400 feet, and contains about 25 acres. The available depth varies from 6 feet at the wharves to a maximum of 17 feet in the protected area. Saranac River empties into Lake Champlain immediately north of and adjacent to the most northerly wharf in the harbor. Its source is situated about 42 miles southwest of Plattsburg. The river is navigable by light draft boats from its mouth up to a dam, a length of about one-half mile.

Burlington Harbor is about 20 miles by water southeast of Plattsburg Harbor.

The city of Plattsburg is a growing manufacturing town, with much water front not now developed but susceptible of development for wharfage. On the opening of the new Champlain Canal this harbor should become an important commercial factor.

The original, which is also the existing, project for improvement adopted by the act of July 4, 1836, was to build a breakwater or pier (estimated cost unknown). In 1870 the project was modified by providing for an extension of the breakwater 400 feet in a northerly direction, the dredging of shoals, and the revetment of the United States land (this latter work has not been undertaken, as the object sought can be obtained more economically by periodical dredging), the estimated cost at that time being $65,000. The river and harbor act of September 19, 1890, again modified the original project by providing for the further extension northerly of the breakwater 300 feet and the replacement of the timber superstructure with stone, the estimated cost of this additional work being $32,500. The river and harbor act of June 13, 1902, appropriated, without previous estimate, $5,000 for maintenance and restoration. The river and harbor act of June 25, 1910, appropriated $25,500, the full amount of the estimated cost of completing the existing project, in accordance with report printed in House Document No. 759, Sixty-first Congress, second session, by dredging to the depth of 9 feet at low lake level the shoal between the breakwater and the wharves, redredging the channel in front of the wharves, and repairing the breakwater, including rebuilding the superstructure of the timber piers with stone. The existing project, as modified, provides for a breakwater 1,565 feet long and for dredging to a depth of 9 feet at low lake level between the breakwater and the wharves.

On June 30, 1912, $191,110.77 had been expended on this project. The portion of the expenditure applied to maintenance can not be ascertained. There was received from sales $0.50.

About 92 per cent of the work proposed under the original project has been completed and has resulted in the construction of a breakwater 1,565 feet long and the creation of a protected harbor behind it. The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement is about 6 feet at low lake level. A draft of about 10 feet can be carried at low lake level to parts of the steamboat landing; elsewhere the depth varies from 6 feet at the wharves to 17 feet within the area protected by the breakwater.

The commerce within the limits of the improvement, mainly in miscellaneous merchandise, as obtained from the best available information, is as follows:

	Short tons.
1904	261,107
1908	253,429
1909	257,950
1910	260,185
1911	262,075

The improvement has resulted in the establishment and maintenance of competition with the railroad, which is believed to have influence in equalizing freight rates. The effectiveness of water competition is neutralized, in part, at least, by inadequate privately owned terminals, believed to be controlled by the railroad.

The present condition of the breakwater is such that the necessity for repairs in addition to those under funds now available is anticipated, and the additional appropriation recommended for the fiscal year 1914 will be applied to that purpose and to maintenance and dredging.

Owing to changes in local conditions since the existing project was adopted, the local officer is of the opinion that certain modifications of the plan of improvement would be desirable, and a reexamination of the locality is therefore recommended.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$4,000

PORT CHESTER HARBOR, N. Y.

This harbor, situated at the boundary between the States of New York and Connecticut, about 32 miles, by water, east of the Battery, New York City, consists of the tidal part of Byram River and of a shallow bay about 100 acres in extent at its mouth opening into Long Island Sound. About 1 mile above its mouth the river is crossed by a fixed bridge at Mill Street, and a short distance above the bridge is an old dam. The source of the river is about 13 miles north of the dam. The navigable part of the river, situated below the bridge, is about 100 to 300 feet wide, and before improvement had a mean low water depth of about 1 foot. Salt Rock, in the river, and Sunken Rock, in the bay, were considered to be dangerous obstructions. The section under improvement extends from Sunken Rock to the fixed bridge, a distance of about 1½ miles.

The existing project adopted by the river and harbor act of June 25, 1910, provides for a channel 150 feet wide and 12 feet deep at mean low water from Long Island Sound to the southerly point of Fox Island; thence 100 feet wide and 10 feet deep to 900 feet below the fixed bridge at Mill Street, including a turning basin opposite the steamboat landing; and thence 175 to 100 feet wide and 3 feet deep to 100 feet below the fixed bridge, in accordance with plan printed in House Document No. 1165, Sixtieth Congress, second session. Estimated cost, $188,000 and $2,500 annually for maintenance. This project has not been modified.

Up to June 30, 1912, $37,008.25 had been expended on the existing project, all for improvement. There was received from sales and reimbursements $4.30.

About 19 per cent of the work proposed under the project has been completed and has resulted in widening the channel in the turn on the easterly side of Fox Island and at a point opposite Bent's dock, these localities having been theretofore among the most difficult sections of the river to navigate.

On June 30, 1912, a maximum draft at mean low water of about 10 feet could be carried up to the southerly point of Fox Island, thence to the steamboat wharf about 9 feet, thence to Highland Street about 2 feet, and thence to the head of navigation less than 1 foot. Mean range of tides, 7.29 feet. The length of the section improved by the United States is about 1⅜ miles. The head of navigation is at a fixed bridge at Mill Street, about 900 feet above the steamboat dock. The total length of navigable channel from Long Island Sound to the bridge is about 1½ miles.

The tonnage and value of the commerce of this harbor, mainly in general merchandise, coal, building materials, manufactured goods, and farm produce, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1898	140,000	$4,936,000	1905	293,000	$7,365,000
1899	169,500	6,256,000	1906	265,000	6,870,000
1900	181,000	7,269,500	1907	275,000	7,405,000
1901	327,500	9,118,000	1908	265,000	7,355,000
1902	237,000	900,000(?)	1909	255,067	7,630,200
1903	240,000	3,940,000	1910	247,223	7,370,830
1904	255,000	4,590,000	1911	287,280	9,165,453

So far as has been ascertained, the improvement of this harbor has brought about and maintained a reduction in freight rates.

The amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, is to be applied to continuing the improvement by dredging and rock removal.

Amount (estimated) required to be appropriated for completion of existing project	$132,864.22
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	15,000.00

RONDOUT HARBOR, N. Y.

This harbor, about 3 miles long and 300 to 1,000 feet wide, is in the mouth of Rondout Creek, located on the west shore of the Hudson River, about 90 miles north of the Battery, New York City. The portion under improvement extends between dikes about one-half of a mile from the entrance to the creek proper, at the shore line, across the flats on the west side of the Hudson to the navigable channel of the river. In its original condition before the improvement was begun this reach was a wide flat through which a channel 7 feet deep at the adopted plane of mean low water and about 400 feet wide had been formed as a result of work done by private parties.

Rondout Creek has its source in Sullivan County, N. Y., about 30 miles southwest of the city of Kingston. The Wallkill River, the source of which is in Sussex County, N. J., about 65 miles south-southwest from Kingston, empties into Rondout Creek about 5 miles above the mouth of the latter. The creek is navigable up to a tide lock at Eddyville, 3 miles from its mouth, and at one time was the easterly section of Delaware & Hudson Canal. It is the outlet by water for Rondout and Kingston, N. Y., and the home port of the principal fleet of towboats operating on the Hudson River.

The original project for improvement, which is also the existing project, is based on report printed in Senate Document No. 35, Forty-second Congress, second session. It was adopted June 10, 1872, and provides for a channel across the mud flats at the mouth of the creek about 3,000 feet long, 14 feet deep at mean low water, and 100 feet wide, by dredging and dike construction, at an estimated cost of $172,500. The project was completed, without modification, in 1880 at a total cost of $90,000. Since then the expenditures have been for maintenance.

Up to June 30, 1912, $143,976.32 had been expended on the project. Of this amount $53,976.32 was for maintenance.

The project has been completed by the construction of a north and a south dike at the entrance, a channel about 3,000 feet long, 100 feet wide, and 14 feet deep at mean low water. The maximum draft that could be carried through the improved channel on June 30, 1912, was 13 feet at mean low water, with a least width of channel of about 75 feet. Above this the depth in the natural channel to Eddyville, situated about 3 miles above the mouth of the creek, is estimated at 8 feet. The length of the improved section is about 3,000 feet. The head of navigation in the creek is at the tide lock of the Delaware & Hudson Canal in Eddyville, N. Y. The mean range of tides is 3.9 feet.

The tonnage and value of the commerce of this harbor, mainly in general merchandise, building and shipbuilding materials, manufactures, and fuel, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1904	1,469,000	$41,065,000	1908	438,000	$2,075,000
1905	1,325,000	46,112,500	1909	440,000	1,820,900
1906	998,524	5,640,900	1910	506,015	4,851,050
1907	1,255,000	5,025,000	1911	510,671	3,355,884

The decrease in commerce since 1905 is mainly due to the removal of the Delaware & Hudson Canal terminus.

The effect of the improvement has probably been to keep the freight rates down during the season of navigation.

It is proposed to apply the amount required for expenditure during the fiscal year ending June 30, 1914, to maintenance, by rebuilding and repairing and extending the south dike and repairing north branch dike, and by dredging for relief of navigation if found necessary. The dike extension is necessary to maintain depths at the entrance.

July 1, 1912, amount covered by uncompleted contracts	$3,722.59
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	5,000.00

SAUGERTIES HARBOR, N. Y.

Saugerties Harbor, about 6,000 feet long and about 200 to 500 feet wide, situated about 100 miles by water above the Battery, New York City, is the name applied to the mouth of Esopus Creek, which has its source in the Catskill Mountains, about 25 miles west of Saugerties. The creek is navigable at high water to a dam and rapids situated about 6,000 feet from deep water in the Hudson River. The original depth at mean low water over a bar at the mouth of the creek was 3 feet, which had been increased by dredging to a depth of 7.5 feet and a width of 100 feet by the State of New York, in 1885–86, prior to improvement by the United States.

When the original project for improvement was adopted vessels drawing 10.5 feet could navigate the harbor at ordinary high water with safety.

The width at the mouth of Esopus Creek before diking was about 1,200 feet, and the creek was navigable for a distance of about 4,000 feet.

The original project, which contemplated securing a permanent channel 7 feet deep at mean low water and 100 feet wide, at an estimated cost of $52,000, was adopted in 1884, modified in 1887, and completed in 1892, with an expenditure of $42,000. To June 30, 1902, $15,000 had been expended for maintenance.

The existing project is based on report printed in House Document No. 107, Fifty-sixth Congress, first session, and was adopted June 13, 1902. It provides for a channel 12 feet deep at mean low water and 200 feet wide from deep water in the Hudson River to the steamboat landing, at an estimated cost of $44,685, with an estimated annual expenditure of $2,500 for maintenance. This project has not been modified.

Up to June 30, 1912, $58,450.53 had been expended on the present project; of this amount $21,332.45 was for maintenance. There was received from sales $4.60.

The expenditure for maintenance is mainly due to restoring the channel above the reef, where, owing to the breaking of the dam a short distance above the head of navigation in the summer of 1902 and the consequent release of a large quantity of mud and silt retained by it, the channel had been reduced in width and depth so as to be practically closed to navigation by large boats, and to the relief to navigation along the wharves on the north side of the channel, where extensive shoaling had taken place, apparently as the result of the removal of the rock off Barclays Point.

About 80 per cent of the existing project has been completed and has resulted in making a through channel of a width of 125 to 200 feet, permitting a maximum draft at mean low water of 12 feet as far as the steamboat landing. The length of the improved section is about 0.82 of a mile. The head of navigation is about 6,000 feet west of the Saugerties Lighthouse, but there is little navigation beyond the steamboat landing, which is located on the south bank of the creek about 4,000 feet from the lighthouse.

The tonnage and the value of the commerce of this harbor, mainly in building materials, manufactures, farm products, and general merchandise, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1901	67,473		1907	95,400	$1,873,000
1902	66.500		1908	114,000	2,070,500
1903	112,677		1909	125,100	2,177,000
1904	113,200	$18,832,195(?)	1910	69,546	2,649,750
1905	81,600	1,598,000	1911	147,494	2,643,000
1906	83,300	1,606,200			

The effect of the improvement, according to the best information available has been to reduce freight rates during the season of navigation.

It is proposed to apply the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, to continuing the improvement and to maintenance, by removal of rock, building, repairing and extending dikes where necessary, and dredging.

Amount (estimated) required to be appropriated for completion of existing project	$5,517.45
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	2,500.00

BRONX RIVER, N. Y.

This stream is about 15 miles long and flows in a general direction slightly west of south. It empties into a shallow bay or estuary about 1 mile long and 300 to 4,500 feet wide, which opens into the East River north of Hunts Point. The navigable part of the river, which is also the section included in the project for improvement, about 50 to 300 feet in width, lies wholly within the limits of Greater New York, about 11 miles by water east of the Battery, New York City, and extends from its mouth to a dam at West Farms, a length of about 2¼ miles. Above the dam the river is very narrow, shallow, and tortuous. The natural depth at the mouth was 4 feet at mean low water, and decreased ascending the stream to about 4 feet at mean high water at the head of navigation.

The original, which is also the existing, project for improvement was adopted June 3, 1896, and provides for making a channel 4 feet deep at mean low water and 100 feet wide from the mouth to Barlow Street (now Falconer Street); thence to Dongan Street (now Garrison Avenue) 60 feet wide, and thence to the head of navigation 50 feet wide, the work to be done by dredging and rock removal. Estimated cost, $85,985. This project has not been modified.

Up to June 30, 1912, $84,212.01 had been expended on the project for improvement, of which amount $16,774.98 was for maintenance. There was received from sales of maps $7.70.

About 78 per cent of the work proposed under the present project has been completed and has resulted in making a channel from the mouth to the turn east of the gas works with depths of from 3 to 6 feet at mean low water and with diminishing widths as projected, except at and below Westchester Avenue, where slightly reduced by ledges of rock. Above the gas works the channel remains in its original condition, except for the partial removal of rocks and bowlders which obstructed navigation in the vicinity of the dye works wharf, and of a few rocks which endangered navigation near the head of the projected improvement. The dredged channel has deteriorated to a considerable extent.

The maximum draft that could be carried June 30, 1912, over the shoalest part of the channel at mean low water from the mouth to the turn east of the gas works, a distance of about 1¾ miles, is about 3 feet for widths varying from 35 to 50 feet; above this point the depth gradually decreases to 1 foot or less for a width generally less than 50 feet, and at the head of navigation it is only about 4 feet at mean high water. The depth in the estuary is but about 3 feet at mean low water. Mean range of tide is 6.6 feet at mouth and 6 feet at West Farms. The length of the improved section extends from the mouth to the gas works, a distance of about 1¾ miles. The head of navigation is at a dam just beyond the dye works. The total length of navigable channel from the East River at Hunts Point is about 3 miles.

The tonnage and value of the commerce of this river, mainly in building materials and coal, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1897	139,310	$526,025	1906	341,538	$1,720,097
1899	171,300	1,985,700	1907	382,957	1,807,317
1902	153,137	500,000	1908	401,433	2,017,500
1903	77,710	536.400	1909	520,215	1,272,266
1904	42,286	196,642	1910	456,756	2,020,386
1905	181,093	820,482	1911	681,181	2,458,798

As the result of the improvement the cost of transportation has been reduced and the river has an extensive and growing commerce, as shown above. This commerce is mainly carried on barges of from 20 to 35 feet width, towed by tugs. Just complaint is made of the interruptions and delays to traffic owing to the impossibility of tows passing each other in the narrow channel and at points of even passing a barge moored to a wharf. Due to the slight depth found, all movement of vessels must be made at high-water stages.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	**$30,000**

Following are extracts from a report on a recent examination, printed in House Document No. 897, Sixty-second Congress, second session:

War Department,
Office of the Chief of Engineers,
Washington, August 2, 1912.

Sir: I have the honor to submit herewith, for transmission to Congress, reports dated April 26, 1911, and February 5, 1912, with maps, by Col. W. M. Black, Corps of Engineers, on preliminary examination and survey, respectively, of Bronx River, N. Y., authorized by the river and harbor act approved June 25, 1910; also a supplemental report dated March 8, 1912.

This river is now being improved under a project which provides for a channel 4 feet deep at mean low water and 100 feet wide from the mouth of Barlow (now Falconer) Street; thence 60 feet wide to Dongan Street (now Garrison Avenue); and thence 50 feet wide to the head of navigation at One hundred and seventy-seventh Street, a distance of about 2½ miles from the mouth. This project is about 78 per cent completed.

The district officer submits with favorable recommendation a project for a channel having a minimum bottom width of 100 feet and a mean low-water depth of 10 feet, involving the first dredging in the estuary from the channel of the East River as far as Randall Avenue to a width of 200 feet; thence to Spofford Avenue 150 feet; thence to Watson Avenue 125 feet; thence to the railroad bridge 100 feet except in the southern approach to the bridge where, owing to the exceedingly sharp turn between the bridges, it is necessary that the width be increased to 140 feet; and above the railroad bridge the bottom width is to be equal to the width between harbor lines—that is, 100 feet, with increase at bends where permissible. At the proposed head of the improvement a turning basin is projected as shown on the map. The estimated cost of this improvement is $930,000, and from $3,000 to $4,000 annually for maintenance.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith dated June 24, 1912. On account of the large cost of the work proposed by the district officer, the board procured from him an estimate of the cost of a smaller improvement, but after further consideration of the subject and an inspection of the locality, the board concurs in recommending the improvement proposed by the district officer as stated above, provided, however, that any right of way necessary for the execution of the project shall be furnished without cost to the United States.

After due consideration of the above-mentioned reports, I concur in general with the views of the district officer, who is also the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress. I report as follows: That the improvement by the United States of Bronx River, N. Y., is deemed advisable so far as to secure an available channel depth of 10 feet at mean low water and a minimum bottom width of 100 feet to the head of navigation at about One hundred and seventy-seventh Street, involving the first dredging in the estuary from the channel of East River as far as Randall Avenue to a width of 200 feet; thence to Spofford Avenue 150 feet; thence to Watson Avenue 125 feet; thence to the railroad bridge 100 feet, except in the southern approach to the bridge where it is to be increased to 140 feet; and above the bridge 100 feet, with increase at bends where permissible, including a turning basin at the head of improvement, following in general the methods described in the report of the district officer, at an estimated cost of $930,000 for first construction and $3,000 to $4,000 annually for maintenance, provided, however, that any right of way that may be necessary for the execution of the project shall be furnished free of cost to the United States. These estimates are based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of $250,000, with authorization for completion under continuing contract.

Very respectfully,

W. H. Bixby,
Chief of Engineers, U. S. Army.

The Secretary of War.

Following is an extract from the report of the board:

It seems clear from the data presented and from the inspection of the locality that there is large tonnage in heavy, bulky materials, such as coal, brick, lime, cement, lath, plaster, etc., which is handled generally on barges of greater draft than is available at low water. It was also apparent that the width of the channel is not sufficient to permit vessels to freely pass when others are lying at the wharves. It was stated at the hearing that at times it is impracticable to get barges up or down the river for several days at a time because of restricted channel dimensions.

The locality adjacent is rapidly developing into a manufacturing and residential district, large areas being covered with new buildings and others under construction. The population has been rapidly increasing, as well as the amount of business done, and everything points to a continued commercial activity. It was stated, apparently upon justifiable grounds, that large savings would accrue to the community if navigation facilities were provided to meet the legitimate needs of commerce. It was the general opinion that a depth of 10 feet is the least that would accommodate the barges and towboats now in service, and that no less depth would meet the future requirements of the vessels to be used in connection with the enlarged Erie Canal.

BROWNS CREEK, N. Y.

This is a narrow stream which empties into Great South Bay, Long Island, near Browns Point. It had originally width varying from 20 to 150 feet and depth of from 1 to 3 feet at low water, a bar at the mouth having less than 1 foot.

The project for improvement, adopted September 19, 1890, provides for a channel from the 6-foot contour in the bay to Sayville highway bridge, to be 100 feet wide and 4 feet deep at mean low water, with 2 feet greater depth at the entrance for a length of 1,500 feet, and to be protected at the entrance by jetties on both sides, the west jetty to be 1,600 feet long and the east jetty 1,400 feet long. Estimated cost, $46,000.

Up to June 30, 1912, $38,734.02 had been expended on the project, of which amount $13,734.02 was for maintenance.

During the year 15,000 cubic yards of material were pumped from the channel and deposited on the adjacent marshes. This work resulted in the restoration of about 1,500 feet of channel to projected depth and width inland from the outer ends of the jetties.

Surveys before and after dredging were made in connection with dredging operations.

After 54 per cent of the work proposed under the project had been completed, resulting in the building of two jetties at the entrance and in the dredging of a channel 100 feet wide and 4 feet deep at mean low water for a distance of 3,200 feet from the entrance, this dredged channel was redredged in 1905 to 4 feet depth at mean low water for a distance of about 1,200 feet from the end of the jetties.

The west jetty has been built to a length of 492 feet and the east jetty to a length of 438 feet, both with top width of 3 feet at 1 foot above high water, and both partly covered at the shore end by accretion. Both jetties have deteriorated to such extent that they offer but slight protection to the channel at the entrance.

The maximum draft that could be carried over the shoalest part of the dredged channel at mean low water June 30, 1912, is about 2½ feet; mean range of tides, 1 foot. The head of navigation is at the Sayville highway bridge, about 1½ miles from the mouth.

Because of rapid deterioration, due mainly to the inflow of mud from the marshes bounding the channel, $13,734.02 has already been expended in redredging; the jetties, built only to about one-third of their projected lengths, offer but slight protection to the entrance.

The total cost of completing the project will be much greater than the original estimate, and if the channel, which is now only 3,200 feet long and requires redredging, is extended upstream, the expenditure for maintenance will increase proportionately.

Considering the limited number of vessels using this creek for transportation purposes, the cost of improving and maintaining the entire length to Sayville, and completing the jetties as projected, would be out of proportion to the benefits to be derived therefrom.

Commercial statistics for Browns Creek for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1898	10,700	$213,800	1906	29,675	$983,880
1899	11,642	251,350	1907	34,975	1,043,865
1901	17,025	454,500	1908	25,240	924,780
1902	17,630	299,300	1909	36,605	1,006,550
1903	20,380	609,450	1910	32,945	906,100
1904	24,000	807,075	1911 [1]	7,950	58,850
1905	51,675	1,811,195			

[1] Reduction attributed to bad condition of channel.

This improvement has resulted in providing a harbor for fishing boats, but probably has had no effect on freight rates.

Amount (estimated) required to be appropriated for completion of existing project	$13,673
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	10,000

EAST CHESTER CREEK.

This creek, also known as Hutchinsons River, empties in to East Chester Bay in the north shore of Long Island Sound, about 12 miles west of the Connecticut State line and about 21 miles, by water, east of the Battery, New York City. Its source is situated about 9 miles slightly east of north from its mouth. The bay is about 3 miles long and about 1,000 feet to 1½ miles wide, and has a minimum navigable depth of 5 feet for a width of 600 feet. The navigable tidal section of the creek, 100 to 1,000 feet in width, extends about 2½ miles above its mouth; above this the stream is narrow and tortuous and practically a rivulet, affected by tides for a length of but about 3,000 feet. The lower 2 miles of the navigable section lies wholly within the limits of Greater New York. The business center of the city of Mount Vernon is situated about 1½ miles northwest of Lockwoods. The section under improvement extends from about 1,900 feet below Pelham Highway Bridge at the mouth of the creek to above Fulton Avenue Bridge, a length of about 3 miles. In its original condition the creek was navigable at high tide for vessels drawing 7 feet to Lockwoods, at Boston Post Road, about 2¼ miles above the head of the bay; above this it was narrow, tortuous, and of slight depth.

The original project for improvement, adopted March 3, 1873, and modified in 1891, provided for a channel 100 feet wide and 9 feet deep, mean high water, from deep water in East Chester Bay to a point 3,000 feet above Lockwoods. Estimated cost, $124,000. This project was completed in 1899 at a cost of $89,091.22, and since then, up to June 30, 1910, $26,410.78 had been expended in maintenance.

The existing project, adopted by the river and harbor act of June 25, 1910, provides for a channel 5 feet deep at mean low water and 150 feet wide from about 1,900 feet below Pelham Highway Bridge to about 700 feet above the New York, New Haven & Hartford Railroad bridge; thence 100 feet wide to about 1,200 feet below Lockwoods; and thence 70 feet wide to about 300 feet above Fulton Avenue Bridge, in accordance with report submitted in House Document No. 1250, Sixtieth Congress, second session. Estimated cost, $103,000, and $3,000 annually for maintenance. This project has not been modified.

On June 30, 1912, $21,564.79 had been expended on the existing project, all for improvement. There was received from sales $3.30.

About 22 per cent of the work proposed under the present project has been completed. Work under the existing project has not advanced far enough to be of any great benefit to navigation.

The maximum draft that could be carried over the shoalest part of the channel on June 30, 1912, to town wharf, about 1¼ miles above the mouth of the creek, is about 3 feet at mean low water; above this the available depth is estimated at 2 feet or less in mid-channel. Considerable shoaling constantly occurs from the filling in of the material from side slopes and from material carried into the stream by sewers and rivulets at the head of the improvement.

Mean range of tides is 7.1 feet. The length of the section improved under previous projects is about 2½ miles. Under the existing project the improved sections are approximately 900 feet and 400 feet long, situated at and below Lockwoods, and about 1,500 feet below Lockwoods, respectively. The head of navigation is at the upper end of the artificial channel. The total length of navigable channel from the East River is about 5 miles, of which about 3 miles is included in the project for improvement.

The tonnage and value of the commerce of this creek, mainly in building material, coal, oil, steel, and products, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1895	94,928	$2,199,186	1906	282,655	$3,063,360
1899	286,428	1,957,224	1907	354,019	1,954,254
1902	99,750	870,500	1908	273,369	2,864,000
1903	104,656	572,800	1909[1]	1,190,669	4,325,364
1904	146,955	963,263	1910	378,400	4,356,900
1905	206,275	1,755,850	1911	435,626	1,956,608

The effect of this improvement under past projects has been to increase the number of firms carrying on business along this stream.

So far as has been learned, this improvement has made no change in railroad freight rates, but the effect has been to increase water-borne commerce, for which freight rates are lower than rail rates. Work under the present project has not progressed sufficiently to have any appreciable effect on commerce.

It is proposed to apply the amount estimated for the fiscal year ending June 30, 1914, to continuing the improvement by dredging and rock removal.

Amount (estimated) required to be appropriated for completion of existing project	$59,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	20,000.00

EAST RIVER AND HELL GATE, N. Y.

East River, a tidal strait about 16 miles long and 600 to 4,000 feet wide, exclusive of bays and estuaries, separating New York City from Long Island, extends from the Battery, in New York City, to Throgs Neck, at the head of Long Island Sound. Though a channel navigable by seagoing vessels has always existed, it was in its original condition rendered tortuous and dangerous by rocks and reefs, especially in the part known as Hell Gate.

The existing project, as modified, provides for the removal of obstructions to the depths given in the following table, and also for constructing two dikes, one connecting Great and Little Mill Rocks and the other closing the channel between Bread and Cheese Reef and Blackwells Island. The construction of the dike at Mill Rocks was completed by the United States in 1882, and the dike at Bread and Cheese Reef was built by the city of New York in 1881.

Table showing work called for under existing project.

Locality.	Distance by water from the Battery.	Least original depth.	Least present depth.	Projected depth.	Remarks.
	Miles.	*Feet.*	*Feet.*	*Feet.*	
Battery Reef	0	12.8	12.8	26	
South Ferry Reef	0	17	19	26	
Diamond Reef	½	15.7	26	26	Completed.
Reef off Diamond Reef	½	19	26	26	Do.
Coenties Reef	½	14.3	25.5	26	
Third Street Reef	3	15.9	26	26	Do.
Shell Reef	2½ -4	7.5	13	18	
Pilgrim Rock	3½	12	24	26	
Twenty-sixth Street Reef	4	16.1	26	26	Do.
Charlotte Rock	4¼	14.7	26	26	Do.
Ferry Reef	4½	7	24	26	
Man-of-War Rock	4¾	+ 0.8	26	26	Do.
Middle Reef (includes Negro Head, Flood Rock, Hen and Chickens, and Gridiron).[1]	7½	+ 6	14.9	26	95 per cent completed.
Heel Tap Rock	7¾	12.1	20.5	26	
Hallets Point Reef	7½	+ 4	26	26	Completed.
Frying Pan Reef	7¾	9	23.8	26	
Pot Rock	8	8	26	26	Do.
Shell Drake Rock	8	8	26	26	Do.
Ways Reef	8¼	5	26	26	Do.
Rock off Negro Point	9	....	....	26	
Scaly Rock	9¼	....	....	....	Reported completed.
Middle Ground [2]	10	11	17.8	26	
Reef off North Brother Island	10¾	16	....	....	
Channel between North Brother and South Brother Islands.[3]	10¾-11¼	19	19	26	
Baretto Reef	11¾	17	26	26	Completed.

[1] Under contract for completing removal.
[2] Under contract for part removal.
[3] Under contract for deepening for a width of about 300 feet.

A report upon a new project for improvement, with maps and estimates of cost, was submitted by the district officer March 2, 1912.

Up to June 30, 1912, $5,219,250.34 had been expended, of which amount $98.02 was for maintenance. There was received from sales of condemned property and maps $1,686.83.

On June 30, 1912, about 67 per cent of the work proposed under the present project had been completed, the through main channel from the Battery to Long Island Sound had a least depth of 30 feet at mean low water and least width of 550 feet, except in Hell Gate, off Hallets Point, where the width is but about 200 feet for a stretch of about 300 feet. The through channel of 26 feet depth has a least width of 550 feet. Between the limiting lines of the 26-foot channel and the shores, rocky obstructions rise to elevations of 13 to 25½ feet below mean low water. The depths along the pierhead lines in New York and Brooklyn vary from 30 to less than 13 feet, making a large part of these water fronts unavailable for deep-sea commerce.

The section of the river in which improvements have been made by the removal of obstructions in the order of their importance to the needs of navigation extends from the Battery to Barretto Point, a length, by water, of 11¾ miles. The main navigable channel passes to the west of Blackwells Island, through Hell Gate and to the north of North Brother Island. It extends from the Battery to Throgs Neck at the head of Long Island Sound, a distance of 16 miles, by water.

The traffic in East River is very great, and is intimately connected with that of New York Harbor proper. The aggregate tonnage in the East River section of Greater New York was estimated in 1911 at 45,331,216 short tons. This does not include through traffic. Data secured from reliable sources in 1909 shows that the number of trips through Hell Gate Channel by steamers and tugs of established transportation lines average about 450 daily, and of ferryboats using and crossing the channel about 400 daily. This does not include barges, lighters, and car floats in tow, or privately owned commercial vessels or yachts. The size of the boats of the transportation lines vary from 50 to 456 feet in length, 12 to 96 feet beam, and 6 to 20 feet draft. Barges and lighters in tow are quite numerous, are of varying dimensions up to 23 feet draft, and are usually made up into tows of three barges each. The car floats are 327 feet long, 40 feet beam, and about 10½ feet draft, and are towed one on each side of a power boat, thus making up a tow of approximately 105 feet wide and 327 feet long. It is reported that about 100 of these car-float tows pass through Hell Gate during each 24 hours.

With the exception of the ferryboats nearly all of this traffic passes through the channel north of North Brother Island in which is situated a reef east of Oak Bluff Light, the subject of numerous complaints urging its removal. The channel is becoming more and more congested with traffic, and the reef complained of has in consequence become a serious menace to navigation. Within the past three years the New York, New Haven & Hartford Railroad Co. has inaugurated a large increase in the ferry slips at Oak Point, and steamers are forced occasionally to stop until tows of car floats are out of the way. The necessities of navigation now demand the early removal of this reef. It is estimated that a depth over it of 26 feet below mean low water can be secured at a cost of $19,000.

While the benefits derived from the improvement can not be shown by its influence on freight rates or directly by the increase in tonnage, the commerce of the river is so enormous, both in tonnage and value, that every improvement which facilitates and lessens the dangers to navigation in this waterway is unquestionably justified. Perhaps the most obvious effect of the improvement is the increase in the number of vessels of large tonnage using the river.

Improvements in the water front now contemplated by the local authorities, if made, will result in a considerable reduction in rates and in the cost of handling freight. The amount of this reduction will be, to a very appreciable extent, dependent upon the size of channels provided by the United States, and on the depth of water provided outside the pierhead lines.

It is proposed to expend the amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, in continuing the improvement under the existing project by the removal of such part of the rocks and reefs as may be by their removal of the most benefit to navigation.

Amount (estimated) required to be appropriated for completion of existing project	$2,773,939.57
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	250,000.00

HARLEM RIVER, N. Y.

The Harlem River and Spuyten Duyvil Creek, both included in the improvement, are two waterways of a joint length of about 8 miles which join at Kingsbridge, N. Y., and separate Manhattan Island from the mainland.

The existing project, as modified, provides for making a continuous channel 400 feet wide and 15 feet deep at mean low water from the East River to the Hudson River, except at Washington Bridge, where the width was made 354 feet, and at the rock cut through Dyckmans Meadow, where the width was reduced to 350 feet and the depth increased to 18 feet. Estimated cost, $2,700,000.

On June 30, 1912, $1,650,502.27 had been expended on the present project, all for improvement. There was received on account of sale and collections $772.82.

About 60 per cent of the work proposed under the present project has been completed, resulting in making a channel 15 feet deep at mean low water and about 400 feet wide from Willis Avenue Bridge to the Madison Avenue permanent bridge, except immediately north of the easterly pier of the Second Avenue Bridge, where ledge rock projects above the improvement plane; thence to One hundred and forty-fifth Street Bridge the same depth and 400 feet wide, except for a few shoals close to the easterly side of the channel and a few projecting points at sewer outlets in the westerly side of the channel; thence to Macombs Dam Bridge the same depth and 150 feet wide. The available depth through the westerly draw channel at Macombs Dam Bridge is about 12 feet; the channel through the easterly draw opening is not navigable, being obstructed by a rocky ledge which projects above the low-water plane to within a short distance of the fender pier. Below Willis Avenue Bridge, between One hundred and twenty-second and One hundred and twenty-sixth Streets, a few rocks, having a minimum clearance over them of 12½ feet, restricting the clear width of the 15-foot channel to 175 feet; except for these rocks a channel 15 feet deep and 350 feet wide has been formed. Both above and below this section of the river the width rapidly increases to 400 feet and over. In 1907 a channel 15 feet deep and 150 feet wide was dredged from Macombs Dam Bridge to the Hudson River. It is probable that this dredged channel has been narrowed by the filling in of material from the sides. The rock cut through Dyckmans Meadow has been completed.

The maximum draft that could be carried June 30, 1912, through the channel from East River to Hudson River at mean low water is estimated at 15 feet, mainly in about midchannel, except through the navigable (westerly) draw channel at Macombs Dam Bridge, where the depth is but about 12 feet.

The total length of waterway is about 8 miles. The channel has been deepened to 15 feet depth at mean low water throughout this length for widths of 150 to 400 feet, except in the westerly draw channel of Macombs Dam Bridge, where ledge rocks project to an elevation of 12 feet below mean low water.

The tonnage and value of the commerce of this river, which is general in character, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1895	7,533,594	$203,707,376	1906	11,385,649	(z)$104,359,757
1903	6,910,386	282,186,100	1907	12,385,507	313,380,748
1904	9,130,763	231,384,004	1909	12,822,885	369,099,686
1905	9,998,021	270,210,309	1911	11,751,632	570,494,998

The opening of the Harlem River to navigation has resulted in greatly increasing the areas of Manhattan and Bronx Boroughs, to which heavy freight can be brought by water with a marked saving in cost.

The amount estimated for the fiscal year ending June 30, 1914, is to be applied to continuing the improvement by dredging and rock removal.

Amount (estimated) required to be appropriated for completion of existing project	$883,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	100,000

The following letter of the Chief of Engineers, submitting report on a recent survey, is printed in House Document No. 557, Sixty-second Congress, second session:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, February 19, 1912.

SIR: I have the honor to submit herewith, for transmission to Congress, reports dated August 7, 1909, and November 17, 1910, with maps, by Col. W. M. Black, Corps of Engineers, on preliminary examination and survey, respectively, of Harlem River, N. Y., with a view of straightening the channel at the curve near the Johnson Iron Works, authorized by the river and harbor act of March 3, 1909.

The existing project for improvement of Harlem River provides for a continuous channel from East River to Hudson River 400 feet wide and 15 feet deep at mean low water, except in two places, viz, at Washington Bridge, where the width is to be 354 feet, and at the rock cut through Dyckmans Meadows, where the width is to be 350 feet and the depth 18 feet. The estimated cost of completing the project in the vicinity of Johnson's foundry is $44,700.

In his report on the survey the district officer, who is also division engineer, has given consideration to several plans for obtaining the improvement specified in the act, varying in cost from $198,100 to $2,030,000, and he has also given consideration to an improvement suggested by interested parties which is estimated to cost $2,770,000. The third plan, estimated to cost $2,030,000, he states will give a full correction to existing conditions and is considered the most advantageous of all the plans. Under this plan the expenditure of $1,180,000 for purchase of private property for the necessary right of way is contemplated, making the net cost of the actual work of improvement $850,000.

When the existing project was adopted the city of New York donated the right of way for the improved channel, and similar action seems proper in the present case; but it appears that the city is not at present prepared to make similar expenditures in connection with the improvement now proposed. The district officer is therefore of opinion that the locality is not worthy of improvement at the present time further than as provided for by the existing project, and that future improvement at this point which would entail the acquisition of additional land should be postponed until such time as the local authorities are prepared to acquire the land and provide the necessary right of way without cost to the United States.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and the board has held hearings at its offices in Washington and in the Borough of the Bronx, which were attended by a large number of persons interested in this improvement. It was there developed that the city authorities, while recognizing that the right of way should be furnished free of cost to the United States, are not now prepared to make the required expenditures. However, they anticipate the necessity for a radical change in the near future in the interests of navigation and desire that the General Government shall designate a plan of improvement which will be best adapted to the needs of prospective commerce, so that they may have before them a plan and estimate for guidance when the proper time arrives for framing the necessary legislation to secure the funds required.

After due consideration of the above-mentioned reports I concur in general with the district officer, who is also division engineer, and the Board of Engineers for Rivers and Harbors in recommending project No. 3, estimated to cost $850,000, exclusive of the cost of necessary right of way, as the most advantageous plan for improvement of this locality, subject to the provision that no construction work shall be executed by the Federal Government beyond the channel limits of the existing projects until local or other interests shall furnish free of cost to the United States the necessary land for the right of way above described. I recommend accordingly a first appropriation of $5,000 to cover all preliminary work upon this $850,000 project up to the time when free transfers of land and rights of way shall allow of commencement of construction work.

Very respectfully,

W. H. BIXBY,
Chief of Engineers, United States Army.

The SECRETARY OF WAR.

HUDSON RIVER, N. Y.

The total sum expended for improvement and maintenance prior to the date of adoption of the existing project is $5,466,752.32.

The existing project, which has not been modified, was adopted by the river and harbor act of June 25, 1910.

It provides for a channel 12 feet deep at all stages from deep water in the lower river to Waterford. This requires the improvement of the existing channel between Hudson and Waterford, a distance of 39 miles.

This project is in accordance with plan printed in House Document No. 719, Sixty-first Congress, second session, and provides for the construction of a new lock and dam to replace the existing State lock and dam at Troy, N. Y., about 1,400 feet north of the said lock and dam; the construction of such work or works appurtenant to the dam as may be necessary for the development, use, and sale of surplus water for power; the granting of leases for the occupation of land belonging to the United States; the removal of the State lock and dam, and the excavation of a channel 12 feet deep at all stages, to be 200 feet wide from above the dam to Waterford; the general width below the dam to be 400 feet except in front of the cities of Troy and Albany, where it is to widen so as to form a harbor at each of these localities. Below the Congress Street Bridge the channel narrows to the proposed general width of 400 feet, which general width, with due increase of width at bends, is to be maintained to deep water in the Hudson River. Estimated cost, $5,186,064. It was intended to complete the said improvement within a period of four years, subject to the provisions stated in the document above referred to.

The requirement that the depth shall be 12 feet at all stages necessitated the establishment of new planes of reference for channel depths, those of lowest water to take the place of the assumed planes of mean low water from which the depths of the earlier projects have been reckoned. These planes of lowest water have been assumed from the recorded planes of lowest water corrected for the changes in tidal regimen and surface slopes which the new and deeper channel will cause.

The requirement of the river and harbor act of June 25, 1910, that the existing water-power rights should be extinguished having been complied with by the action of the New York State Canal Board, under date of November 22, 1910, the preparation of detail plans for the work was carried on until notice of the rescinding of that resolution by that board, the personnel of which had been changed, was received under date of April 28, 1911, after which all work was suspended, except the work incident to the carrying on of a contract previously made for rock removal, dated February 3, 1911, and the work necessary for maintenance.

Under date of September 15, 1911, the Secretary of War directed the resumption of work on such portions of the project as were not dependent upon the construction of the lock and dam, and under date of February 17, 1912, instructions were received that all work under the project be resumed. On March 1, 1912, the final location of the dam, as originally recommended in House Document No. 719, Sixty-first Congress, second session, was approved by the Secretary of War, as required by the terms of the act adopting the project.

The work done during the year consists of the preparation of detailed plans and specifications for the construction of the new lock and dam at Troy, N. Y., and new dikes; plans and experimental work for raising crest of old dikes; the letting of contracts for the construction of new dikes; the furnishing of material and the construction of plant for repairing and raising of old dikes and the commencement of this work; the maintenance of the improvement by repairing old dikes; the removal of rock from the channel; the construction of new dikes under contracts; and the enforcement of the navigation laws.

The total amount expended under the existing project prior to June 30, 1912, is $147,192.78, of which amount $21,238.01 was expended for maintenance. There was received from sales, etc., $297.41.

The proportion of the approved project accomplished up to June 30, 1912, is about 3 per cent.

The maximum draft that can be carried at lowest low water is 8.5 feet.

The length of the section under improvement is about 39 miles.

The head of navigation for present tidal portion of the river is at the State dam, 153 miles north of the Battery in New York City. Above the dam the river is navigable and navigated to Waterford and from there is connected by canal with the Great Lakes and with Lake Champlain. The total length of the navigable river from Waterford to the Battery at New York City is 156 miles.

The commerce within the limits of the improvement, mainly in general merchandise, farm products, building material, fuel, and ice, as obtained from the best available information, is as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1908	2,945,921	$120,421,651	1910	5,033,360	$109,941,000
1909	3,254,423	237,214,824	1911	4,241,478	92,109,313

During the season of navigation a large volume of traffic follows the railroad only because of lack of water transportation. The improvement accomplished so far has resulted in the establishment of an increasing passenger and freight packet business between the upper Hudson and New York. A direct result of the improvement has been to install in this service the largest river steamers to-day afloat in the United States, and in anticipation of benefits to be derived from the existing project two new steamboats, larger than their predecessors and stated to cost about $1,250,000 each, are under construction.

The service of these steamers has resulted in strong competition with the railroads, by which freight rates are maintained within bounds. The status of water-borne freight traffic is at present unstable in view of the plans on foot for the development of traffic on the opening of the New York State Barge Canals and the further improvement of the river contemplated in the present project.

It is proposed to apply the amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, to continuing the improvement by dredging, rock removal, and dike raising and repair, and to emergency dredging for channel maintenance where required for relief of navigation. The work proposed is necessary to make the improvement available.

Amount (estimated) required to be appropriated for completion of existing project	$3,104,093.84
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	1.560,000.00

NEWTOWN CREEK, N. Y.

This creek, an inlet of the East River, extending inland between the Boroughs of Brooklyn and Queens, in New York City, for a distance of about 4 miles, had a natural depth varying from 12½ feet at the mouth to 4 feet at the head of navigation.

The original project, adopted in 1880 and modified in 1884, provided for a channel 240 feet wide and 21 feet deep from the mouth to the Vernon Avenue Bridge; thence to the head of navigation on both branches or channels, decreasing from 175 to 100 feet in width and from 18 to 10 feet in depth. The cost of the work was estimated at $255,500. In carrying out this project $197,500 was expended.

The existing project, adopted June 3, 1896, provided for a uniform channel 125 feet wide and 18 feet deep from the East River to the head of navigation in the creek and in English Kills, respectively, at the Metropolitan Avenue Bridge, at an estimated cost of $450,000. This estimate was subsequently reduced to $213,000. The channel having been reported completed with the exception of some widening at the entrance, $15,000 was appropriated by act of Congress approved March 4, 1907, for continuing the improvement. This increased the estimate for completion to $228,000.

Up to June 30, 1912, $243,031.33 had been expended on the project. Of this amount $39,267.52 was for maintenance. Received during the year from sales of maps, $2.75.

During the year 5,666 cubic yards of material were removed from the channel in the vicinity of the Meeker Avenue Bridge, and resulted in the restoration of about 550 feet to projected depth, and a width of 90 feet under a contract now in operation.

About 90 per cent of the work proposed under the present project has been completed, resulting in making a channel of the projected width and depth, with the exception of some widening at the entrance. The channel requires extensive redredging.

The maximum draft that could be carried over the shoalest part of the channel June 30, 1912, at mean low water was about 14 feet. The mean range of tides is about 4½ feet. The total length of navigable channels is about 4 miles. The head of navigation in the creek is at Metropolitan Avenue Bridge, about 3 miles from the entrance, and in English Kills at Metropolitan Avenue Bridge, about 3½ miles from the entrance. The length of channel under improvement is about 3 miles in the creek and about one-half mile in the kills.

Commercial statistics for Newtown Creek for various years are given in the following table:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1903	2,675,025	$90,535,640	1908	4,181,528	$229,994,000
1904	3,771,726	108,313,377	1909	5,113,628	253,003,661
1905	3,428,404	130,812,974	1910	3,861,852	139,378,623
1906	2,803,380	214,714,751	1911	5,435,016	191,747,615
1907	3,108,374	175,229,346			

The increased depth resulting from this improvement has greatly benefited commerce.

Freight rates have been reported as greatly reduced by this improvement. It is difficult if not impracticable to ascertain details; but the large and valuable commerce of this water is the best index to the effect of the improvement.

It is proposed to apply the amount estimated for the fiscal year ending June 30, 1914, to maintenance.

July 1, 1912, amount covered by uncompleted contracts	$22,959.56
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	30,000.00

WAPPINGER CREEK, N. Y.

Wappinger Creek is a small stream which empties into the Hudson River from the east about 64 miles by water, north of the Battery, New York City, and about one-half mile below the village of New Hamburg, N. Y. Its source is situated about 30 miles slightly east of north from its junction with the Hudson River. It is obstructed by a series of falls with an aggregate height of 86½ feet above mean low water, at the village of Wappinger Falls, about 2 miles above the mouth of the creek. Below the lower fall, which marks the head of navigation, the creek has a least width of about 90 feet and a greatest width of about 900 feet. Before improvement this section of the creek had a navigable depth not exceeding 6 feet at mean low water through a winding channel, but from 25 to 75 feet wide. An annual freshet raises the level of the water at the head of the creek not exceeding 10 feet.

The mouth of the creek is crossed by a solid fill and trestle bridge provided with a draw span built by the New York Central & Hudson River Railroad, and about 1,000 feet above this bridge a highway crosses the creek over a solid fill having a draw span. The railroad bridge has a horizontal clearance of 40 feet and the highway bridge one of 48 feet.

The section of the creek included in the project for improvement extends from the mouth to about 200 feet below a stone bridge at the lower fall.

The original, which is also the existing, project for improvement is based upon report printed in House Document No. 25, Fifty-first Congress, first session. It was adopted September 19, 1890, and provides for a channel 8 feet deep at mean low water and 80 feet wide, extending from the mouth to about 200 feet below the lower fall. Estimated cost, $13,000. The project was completed, without modification, April 30, 1892, at a cost of $13,000.

The work done during the fiscal year resulted in restoring the channel to its projected depth of 8 feet at mean low water from its mouth to the head of the improvement for a least width of 60 feet to 80 feet in the approaches to the railroad bridge, and above this to a least width of 50 feet, except about 100 feet below Brick Yard Dock, where ledge rock uncovered during the dredging reduced the width to about 40 feet. Amount expended during fiscal year, $5,808.59.

Up to June 30, 1912, $25,391.92 had been expended on the project; of this amount $12,391.92 was for maintenance. There was received from sales $0.50.

The project was completed in 1892, since when the channel has been maintained by redredging to such extent as the available funds would permit.

The maximum draft that could be carried June 30, 1912, at mean low water from deep water in the Hudson River to the head of the improvement is about 8 feet for an estimated width of 40 feet, except in the approaches to the railroad bridge, where it is 50 to 70 feet, and about 100 feet below Brick Yard Dock, where it is reduced to about 30 feet by a projecting ledge. It is estimated that the widths of the cuts dredged in 1911 have been reduced to the widths here given by the flowing in of the soft material of the adjacent flats.

Mean range of tides at the mouth of the creek is about 3.3 feet Annual freshets raise the level of the water at the head of navigation not exceeding 10 feet. The head of navigation is at the bridge and lower fall, about 200 feet above the head of the improved channel. Length of improved channel about 2 miles.

The tonnage and value of the commerce of this creek, mainly in cotton goods, building material, and fuel, as obtained from the best available information, are as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1904	56,927	$7,955,975	1908	41,574	[1] $6,990,605
1905	49,562	4,872,903	1909	45,395	7,476,731
1906	46,194	572,399	1910	33,085	1,964,036
1907	44,493	445,765	1911	23,248	2,290,632

The improvement tends to keep railroad freight rates down.

The amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, is to be applied to dredging for maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement.. $3,500

WESTCHESTER CREEK, N. Y.

This is a small stream lying wholly within the limits of Greate. New York, extending from an estuary about 14 miles by water easr of the Battery, New York City, northward a distance of about 4 milest The estuary is about 1 mile long and 500 to 3,000 feet wide, with a navigable depth of 5 feet at mean low water. The section of the creek included in the project ends at a causeway and fixed bridge at Main Street, in Westchester. It is about 1.7 miles long and 110 to 500 feet wide. Above the bridge the stream was narrow, shallow, and tortuous. It is probable that within recent years the bed of the creek above the bridge has been filled in to a considerable extent by city and railroad improvements.

When surveyed in 1891 the creek was navigable at mean low water for vessels drawing 3½ feet and had a navigable channel varying in width from about 20 to 80 feet.

The section included in the project for improvement extends from the East River across the estuary to the fixed bridge, a distance of about 2¾ miles.

The original, which is also the existing, project was adopted June 25, 1910, and provides for a channel 8 feet deep at mean low water and 100 feet wide across the estuary; thence 80 feet wide to about 1,000 feet above Scriven's wharf; and thence 60 feet wide to the head of navigation, in accordance with plan printed in Rivers and Harbors Committee Document No. 7, Sixty-first Congress, second session. Estimated cost, $42,780 and $2,000 annually for maintenance. This project has not been modified.

Contract has been entered into for this work, but active operations had not been commenced at the close of the fiscal year. Expenditures for the year, amounting to $1,663.13, were in payment of the cost of marking the limits of work under a contract now in force, of the cost of printing and advertising; and in part payment of office expenses, and of the purchase price of Mill Rock in East River for storage purposes.

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[1] Increase due to more accurate returns from interested parties for 1908 than for 1906 and 1907.

Up to June 30, 1912, $5.418.52 had been expended in making a resurvey and map of the reach to be improved, including the development of rock surfaces over which the projected depth is to be obtained; in part payment of office expenses, including marking the limits of the contract work, and of printing and advertising for the contract; and in part payment of a gasoline cutter and of Mill Rock, East River, bought for a storage yard.

When resurveyed in 1910 a maximum draft of 5 feet could be carried over the bar in the estuary, from which point up to within about 1,500 feet below the head of navigation at a fixed bridge at Main Street in Westchester the depth was generally greater; above this to the head of navigation the maximum available draft was about 3½ feet. It is not probable that an appreciable change in these depths has taken place since then. Mean range of tides, 6.8 feet. The length of navigable channel from the East River is about 2⅔ miles, no part of which has yet been improved.

The tonnage and value of the commerce of this creek, as obtained from the best available information, and consisting mainly in building materials, coal, etc., are as follows:

Year.	Short tons.	Value.
1890	50,000	$242,000
1909	263,857	1,371,235
1911	148,117	699,564

Effect on rates awaits completion of channel to be dredged under a contract now in force.

Amount (estimated) required to be appropriated for completion of existing project	$12,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	12,000

ARTHUR KILL, OR STATEN ISLAND SOUND, AND CHANNEL NORTH OF SHOOTERS ISLAND, BETWEEN NEW YORK AND NEW JERSEY.

(*a*) *Arthur Kill, or Staten Island Sound, New York and New Jersey.*—This is a waterway about 12 miles long, which, together with the lower end of Newark Bay, 2 miles long, and the Kill Van Kull, 3 miles long, forms the inland waterway between upper New York Harbor and Raritan Bay. The section now contemplated under this improvement consists of the 14 miles of channel between Kill Van Kull and Raritan Bay. The original depth through the Arthur Kill, or Staten Island Sound, at mean low water was 15 feet and upward in a channel 100 to 1,000 feet in width. Through the lower end of Newark Bay the navigable channel depth was about 14 feet at mean low water, the result of an improvement commenced in 1874 and continued up to the present time. In the present project the new channel was cut through the flats to the southward of the original channel, on which the depth was 1 to 2 feet at mean low water.

The existing project for this improvement, which is printed in House Document No. 393, Fifty-sixth Congress, first session, was adopted by the river and harbor act approved June 13, 1902, and provides for making and maintaining a channel from Kill Van Kull to Raritan Bay, New York and New Jersey, by means of dredging and diking, 300 feet wide and 21 feet deep at mean low water, at an estimated cost of $696,000, and $5,000 for annual cost of maintenance. Experience indicates that the annual cost of maintenance will be not less than $25,000. Work under this project was authorized to be done under continuing contracts, the full amount authorized having been appropriated. The amount expended on the project to June 30, 1912, was $626,357.36, of which amount $626,261.25 was used in carrying out the project and $96.11 for maintenance, and $2,853.50 additional for a harbor-line survey. The sum of $130.56 was derived from the sale of maps.

Operations during the past fiscal year consisted of rock removal at the Baltimore & Ohio Railroad bridge; 21,865 cubic yards of material were removed under this contract from February to June, inclusive. The plant arrived on the work December 26, 1911, chiseling was commenced December 30, and dredging was begun February 7, 1912. Work was in progress at the close of the year.

The dredging contemplated by this project has been completed and the 21-foot channel has been dredged through the waterway, with a width of about 300 feet.

The maximum draft that could be carried through the entire length of the improved waterway on June 30, 1912, was 20 to 21 feet at mean low water. Mean range of tides, 5 feet.

It is proposed to apply the available funds to dredging for maintenance, in accordance with the adopted project. The appropriation recommended will be applied to maintenance.

The freight carried through this waterway consists of oil, coal, ores, clay products, chemicals, fertilizers, grain, machinery, manufactures, and general merchandise, and amounted in 1899 to 11,311,991 tons; in 1901 to 11,651,300 tons; in 1902 to 14,517,079 tons; in 1903 to 11,512,420 tons; in 1905 to 11,721,861 tons, valued at $265,193,813; in 1906 to 16,574,840 tons, valued at $355,579,817; in 1907 to 14,948,077 tons, valued at $245,032,666; in 1908 to 15,995,231 tons, valued at $239,395,113; in 1909 to 15,629,768 tons, valued at $249,114,846; in 1910 to 15,930,332 tons, valued at $230,449,455; and in 1911 to 17,800,977 tons, valued at $263,352,020. Tonnage reported before 1908 in long tons; since reported in short tons.

It appears from inquiry that no estimate can be made of the exact effect of the project on freight rates, except as to the local commerce upon which the rates have been reduced by this improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] $30,000

(*b*) *Channel north of Shooters Island between New York and New Jersey.*—This is an extension of the existing project for the improvement of Arthur Kill or Staten Island Sound from Kill Van Kull to Raritan Bay. Before improvement there was no channel within the limits covered by this project, the locality being a part of the flats at the lower end of Newark Bay, except at the western end, which is a part of the old channel improved under the head of the channel between Staten Island and New Jersey. The object of this channel is to relieve the congestion in navigation of the main channel south of Shooters Island. In its natural condition the central and eastern part of this new waterway was a part of the flats referred to on which the depth was from 2 to 5 feet at mean low water. The length of this channel is about 1 mile, with a width of 300 feet and depth at mean low water of 16 feet.

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[1] Including maintenance of channel north of Shooters Island.

This project also includes the removal of a middle ground in the main channel of Newark Bay, northeast of Shooters Island, between Bergen Point and Shooters Island; the removal of a part of Bergen Point Reef and the middle ground at Corner Stake Light, at an estimated cost of $280,115, with $5,000 annually for maintenance. Provision was made for this project in the river and harbor act approved June 25, 1910, in accordance with plan printed in House Document No. 337, Fifty-ninth Congress, second session.

The amount expended on the project up to the close of the fiscal year ending June 30, 1912, was $122,838.83, which was for work of improvement.

Operations during the fiscal year consisted in dredging under a continuing-contract authorization of $180,115, made by the river and harbor act of June 25, 1910, of which $60,115 remains to be appropriated. Dredging was in progress at the beginning of the year, at which time 380,094 cubic yards had been removed from the channel. During July to January, inclusive, and March to May, inclusive, 231,005 cubic yards of material were removed from the channel. During September to April, inclusive, 148,165 cubic yards were removed from the middle ground at Corner Stake Light. This part of the work is nearly completed, having depths from 13 to 16 feet at mean low water; it is being used. Work was in progress at the end of the year on the middle ground in Newark Bay, from which 39,447 cubic yards were removed during May and June. Total yardage removed to end of fiscal year, 418,617.

The mean range of tides is 5 feet. This is a connecting channel, and the commerce to be benefited will be a part of the Arthur Kill, which in 1911 amounted to 17,800,977 short tons, with an estimated value of $263,352,020, and of Newark Bay and Passaic River, amounting in 1910 to 2,266,291 short tons, with a value of $62,216,587.

Consolidated.

Amount (estimated) required to be appropriated for completion of existing project	$60,115
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	30,000

Following is the report of the Board of Engineers on a recent survey, which is printed in House Document No. 1124, Sixty-second Congress, third session:

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, October 14, 1912.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. This is a report of survey of New York Harbor, N. Y., with a view to securing increased width and depth of water from a point at or near Southwest Spit, northwest

of Sandy Hook, N. J., through lower New York Bay, Raritan Bay, and the channel between New Jersey and Staten Island, N. Y., to the channel in upper New York Bay, submitted in accordance with the act of February 27, 1911. The present project depth is 21 feet, and the mean tidal range is about 5 feet.

2. The district officer considered it desirable to secure data upon which estimates could be based for channels ranging in depth from 30 to 40 feet, and this was done. In considering depths of 35 to 40 feet it was found that, in addition to the 12 miles through Raritan Bay, channel work would have to be extended about 6 miles to the eastward of Southwest Spit. The district officer states there is nothing in the statistics obtained to show that a low-water depth of over 30 feet is at present necessary. The prime object of the improvement is to afford access for deep-draft cargo vessels to the channel between Staten Island and New Jersey, where there are now many large industries and where others are in contemplation.

3. To provide a depth of 30 feet from main channel off Sandy Hook, which now affords that depth, will require about 12 miles of dredging in Raritan Bay and 10 miles in Arthur Kill. If entrance is made by way of Ambrose Channel and Kill Van Kull, a 30-foot channel can be obtained through Arthur Kill to Perth Amboy by dredging only 10 miles, but a turning basin would have to be provided below the Rahway River in lieu of the channel across Raritan Bay.

4. The report of survey gives detailed estimates for channels 30, 35, and 40 feet in depth through the reach under consideration, crossing Raritan Bay both by way of Seguine Point, or the present channel route, and by way of a more expensive line leading straight from Main Channel to the turn near Great Beds Light. The channel is 1,200 feet in width across Raritan Bay to opposite Smith Street in Perth Amboy, thence through Arthur Kill 400 feet wide to east end of Shooters Island, and thence 500 feet wide to deep water in the upper bay. At the request of the board the district officer also prepared estimates for a through channel 25 feet in depth by both the straight and the Seguine Point routes, including a turning basin at mouth of Fresh Kills. The estimates via the Seguine Point route, including a turning basin in the Arthur Kill for the 25 and 30 foot depths are as follows:

Depth of channel.	Raritan Bay.	Arthur Kill and Kill Van Kull.	Total.
25 feet	$2,550,673.00	$2,126,888.38	$4,677,561.38
30 feet	7,738,557.98	11,371,948.01	19,110,505.99
35 feet	11,264,406.24	22,493,532.77	33,757,939.01
40 feet	14,168,983.13	42,465,576.08	56,634,559.21

The estimated cost of maintenance for the Raritan Bay section is $100,000 for the 25-foot channel and $150,000 for the 30-foot channel; for the Arthur Kill and Kill Van Kull section the estimate is $50,000 in each case.

5. The district officer, who is also division engineer, expresses the opinion that this waterway is worthy of additional improvement to the extent of providing the 30-foot channel via the Seguine Point route.

6. In connection with its consideration of this project the board held a public hearing in New York City on September 24, 1912, and made a personal examination of the waterway in question, with a view of determining the necessity of further improvement and more especially the need of the channel across Raritan Bay, and the comparative merits of channels 25 and 30 feet deep.

7. The need of increased channel dimensions is shown in the report on preliminary examination, to which reference is invited. It appears from data contained therein that there are now in excess of 500 vessels in use having a draft of 20 feet or more, carrying an approximate tonnage of 1,294,000, and that approximately 42 vessels were unable to dock on account of insufficient depth. Information regarding the number of vessels drawing over 20 feet that would be docked during a year, provided there was sufficient depth of water, is not specific, but it indicates that such number would be large.

8. While it is seen that there is a considerable tonnage carried on vessels of 20 feet draft or more, the amount that is handled in vessels of 25 feet or more is not large and constitutes a very small proportion of the total amount of traffic on this waterway, the great bulk of which is fairly well served by the present depth. If a depth of 30 feet were given, there would no doubt be some vessels making use of the waterway with a draft requiring that depth, but the number would be limited, and in the opinion of the board would not justify at present the very large additional cost of a 30-foot

channel over a 25-foot channel. There is evidence, however, that the present depth and width of the channel are inadequate to meet the growing demands of a considerable amount of traffic, and an increase in depth from 21 to 25 feet is a logical and economical step, and it is believed that this increase should first be given and its adequacy tested before incurring the much greater cost of a channel 30 feet in depth.

9. A large number of persons in attendance at the hearing addressed the board and in general terms advocated the channel across Raritan Bay, stating that it would be more convenient for vessels to depart by that route than to return through Kill Van Kull. It is stated in the report of the district officer that no distance will be saved by the channel through Raritan Bay except for vessels bound to the Amboys or to places between the Amboys and a point 5 miles above, as that point is about equidistant from the mouth of the harbor by way of Raritan Bay or the Ambrose Channel and the Kill Van Kull. Moreover, the entrance via the Ambrose Channel is better lighted at night and more easy of access. The principal commerce of this waterway, even if a greater depth is given, will be carried on vessels not exceeding 21 feet in draft, and these can be accommodated by the existing channel through Raritan Bay. In the opinion of the board, the benefits to be afforded by the greater depth across the bay are insufficient to warrant an expenditure of $2,500,000 for this channel and its large annual cost of maintenance. The additional time that may be required for some vessels in turning and going through Kill Van Kull is insignificant when compared with the length of an ordinary tramp steamer's journey.

10. After careful consideration and study, the board has arrived at the conclusion that the commerce of this locality has reached a point when some increased facilities are reasonably demanded, and that these needs will be fairly well served by a channel 25 feet in depth, extending from the upper end of the waterway down to Perth Amboy, with a suitable turning basin. It therefore recommends a channel 25 feet in depth from Perth Amboy to the channel in upper New York Bay and a turning basin at the mouth of Fresh Kills of the same depth, at a total estimated cost of approximately $2,130,000 and $50,000 annually for maintenance. The initial appropriation should be $500,000, with continuing contract authorization for the remainder, with a view to completion of the work in a period of four years.

11. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other subjects which could be coordinated with the project proposed in such manner as to render the improvement advisable in the interests of commerce and navigation.

For the board:

Lansing H. Beach,
Lieut. Col., Corps of Engineers,
Senior Member Present.

KEYPORT HARBOR, MATAWAN CREEK, RARITAN AND SOUTH RIVERS, SHOAL HARBOR AND COMPTON CREEK, AND CHEESEQUAKE CREEK, N. J.

(*a*) *Keyport Harbor.*—This harbor is situated at the mouth of Matawan Creek, on the south side of Raritan Bay, 5 miles east of the mouth of Raritan River, and it consists of a bay about 1 mile broad.

There was no distinct natural channel in the harbor, the available depth to the wharves being less than 4 feet at mean low water. A 6-foot channel had been dredged at private expense before the United States assumed charge of the improvement, but it had shoaled again to 3 feet.

The original and existing project, approved August 2, 1882, with subsequent modifications (1883), contemplates dredging a channel 8 feet deep at mean low water, about 4,700 feet long and 200 feet wide, from Raritan Bay to the steamboat dock at Keyport, at an estimated cost of $40,475.

The amount expended to June 30, 1912, was $90,426.80, of which sum $40,475 was used in carrying out the project and $49,951.80 for maintenance. A channel of the required length and nearly the proposed width was completed in 1883–84. The improvement has been practically completed. Maintenance is necessary.

The maximum draft that could be carried June 30, 1912, to the Keyport wharves was about 8 feet at mean low water. Mean range of tides, 4.9 feet.

The commerce of this harbor is mainly in farm products, fertilizers, coal, lumber, fish, shellfish, and miscellaneous freight, and, including the commerce of Matawan Creek, amounted in 1899 to 138,500 tons; in 1901 to 105,000 tons; in 1902 to 123,500 tons, valued at $2,893,000; in 1904 to 99,600 tons, valued at $2,022,000; in 1905 to 86,821 tons, valued at $2,202,105; in 1906 to 229,377 tons, valued at $3,074,060; in 1907 to 160,925 tons, valued at $3,275,305; in 1908 to 123,724 tons, valued at $3,146,800; in 1909 to 50,932 tons, valued at $1,345,020; in 1910 to 77,998 tons, valued at $1,783,136; and in 1911 to 96,477 tons, valued at $1,868,650. Tonnage reported since 1907 in short tons; previous reports in long tons.

The effect of this improvement has been to greatly reduce freight rates, especially in the marketing season.

It is proposed to apply the available balance, and the amount to be appropriated to maintenance of the improvement, in accordance with the adopted project.

(*b*) *Matawan Creek.*—This creek is a small tidal stream in the eastern part of New Jersey which discharges into Raritan Bay through Keyport Harbor. It is navigable up to the bridge of the New York & Long Branch Railroad, about 2 miles above its mouth.

In its natural condition the mouth was obstructed by a mud flat, through which a narrow and crooked 3-foot channel existed. Above this flat there was a 4-foot channel for a mile and beyond a narrow 3-foot channel extending nearly up to the head of navigation at Matawan.

The original and existing project for improving this stream, by dredging a 4-foot channel 100 feet wide from the mouth to Winkson Creek, about 1 mile, and thence 75 feet wide to the railroad bridge at Matawan, was adopted March 3, 1881. The cost was estimated at $33,120.

The amount expended to June 30, 1912, was $65,647.96, of which $21,000 was used in carrying out the project and $44,647.96 for maintenance. Of this amount $1.50 was derived from the sale of maps. About two-thirds of the work proposed under the project has been completed, and a channel has been dredged the required distance with widths of 50 to 100 feet, but this channel has greatly deteriorated.

The maximum draft at mean low water that could be carried June 30, 1912, to the head of navigation was about 4 feet for three-quarters of the distance and 2 feet for the remainder. Mean range of tides, 4.9 feet.

The commerce of this creek is in brick and fireproofing, fertilizer, shellfish, top soil, coal, and general merchandise, and amounted to 51,000 tons in 1899, to 60,000 tons in 1901, to 61,500 tons in 1902, valued at $1,265,000; to 29,600 tons in 1904, valued at $74,000; to 58,471 tons in 1905, valued at $203,955; in 1906 to 128,181 tons, valued at $717,505; in 1907 to 40,900 tons, valued at $163,500; in 1908 to 10,167 tons, valued at $38,265; in 1909 to 16,800 tons, valued at $22,000; in 1910 to 41,420 tons, valued at $46,620; and in 1911 to 48,745 tons, valued at $86,050. Tonnage reported since 1907 in short tons; previous reports in long tons.

The effect of this improvement has been to greatly reduce rates of freight, especially in the marketing season. Recent appropriations have been insufficient to maintain the channel in the upper part of the creek, where the market boats load; consequently that branch of the commerce has been abandoned.

It is proposed to expend the amount to be appropriated for maintenance of the project.

(*c*) *Raritan River.*—This river is a moderate-sized stream, flowing through the central part of the State of New Jersey and emptying into Raritan Bay at Perth Amboy. It is navigable to New Brunswick, N. J., a distance of 12 miles, where it is the eastern terminus of the Delaware & Raritan Canal.

In its natural state the channel to New Brunswick was obstructed by many extensive shoals, on which the depth was from 6½ to 8½ feet at mean low water, the shoals being in the upper 9 miles of the river.

The sum of $13,963, appropriated in the years 1836 and 1837, was expended in removing obstructions from the river at New Brunswick.

The existing project for improvement, adopted June 18, 1878, with subsequent modifications, provides for a channel 200 feet wide and 10 feet deep from the mouth to the Delaware & Raritan Canal terminus at New Brunswick, including a south channel between Crab Island and Kearney's dock, with a length of about 2½ miles, width of 100 feet, and depth of 5½ feet at mean low water, to be obtained by dredging, diking, and rock excavation, the cost being estimated at that time at $2,093,662. Recent and improved methods for doing such work have made it probable that this estimate will not exceed $1,035,000.

The amount expended upon the existing project up to the close of the fiscal year ended June 30, 1912, was $740,912.04, of which $659,192.32 was used in carrying on the work and $81,719.72 for maintaining that already done; of this amount $1.37 was derived from sale of condemned property and from sale of maps. About two-thirds of the work contemplated under the project has been completed, and the following work has been accomplished under the project: A channel 10 feet deep has been made from the mouth to the Delaware & Raritan Canal terminus at New Brunswick, the section through and below the reef at Whitehead's dock, 8 miles from the mouth, having a width of 200 feet and the section above the reef a width of 100 feet. South channel has been dredged to the projected depth and width for a length of about 4,000 feet, but has since shoaled to almost original depth. Five dikes have been built to maintain the channels.

It is proposed to apply the available balance and the amount recommended to be appropriated to maintaining the improvement.

On June 30, 1912, the maximum draft that could be carried in the river was 10 feet to within 1 mile of the head of navigation, and 9 feet for the remainder of the distance. Mean range of tides: At mouth of river, 5.1 feet; at New Brunswick, 5.56 feet.

The commerce of this river is principally in coal, ores, refined copper, lumber, building materials, and general merchandise, and, including the commerce of the South River, amounted in 1906 to 736,666 tons, valued at $17,377,645; in 1907 to 725,690 tons, valued at $32,678,472; in 1908 to 918,302 tons, valued at $26,401,439; in 1909 to 936,533 tons, valued at $48,504,916; in 1910 to 963,473 tons, valued at $53,355,340; and in 1911 to 1,100,851 tons, valued at $64,441,303. Tonnage reported before 1908 in long tons; since reported in short tons.

It appears from numerous letters received that this improvement has resulted in a very material reduction of freight rates.

(*d*) *South River.*—This is a small stream in the central part of New Jersey, which discharges into the Raritan River about 8 miles above its mouth. Before improvement by the United States a private canal about three-fourths of a mile long had been dredged from near Washington, on the South River, to Sayreville, on the Raritan River, which shortened the sailing course about 2 miles.

The low-water depth in the canal was about 3.5 feet and in the river about 2.5 feet as far as Oldbridge, at the head of navigation, 6.3 miles above the canal.

The first project for this improvement was adopted March 3, 1871, and provided for dredging a channel 6 feet deep at mean low water up to the Washington wharves, at an estimated cost of $13,653. This was completed in 1874, at a cost of $20,000.

The existing project, adopted June 14, 1880, provides for correcting the canal outlet and for obtaining, by dredging and diking, a channel 100 feet wide and 8 feet deep to Washington, 1.5 miles above the mouth; thence 6 feet deep to Bissetts, 3.7 miles above the mouth; thence 4 feet deep to Oldbridge, 6.3 miles above the mouth, at the head of navigation. The cost was estimated at $194,695, but was reduced in 1892 to $176,695.

The amount expended on the present project up to the close of the fiscal year ending June 30, 1912, was $132,375.10, of which $92,077.03 was used in carrying on the work and $40,298.07 for maintenance. Of this amount $1 was derived from sale of map. About one-half of the work contemplated under the project has been completed. Below the wharves at the village of South River or Washington a channel from 50 to 75 feet wide and 8 feet deep has been dredged, and the projected dikes have been built. Above Washington the proposed channel 100 feet wide and 6 feet deep, mean low water, has been completed to Bissetts Dock.

An addition to this project, adopted by the river and harbor act approved July 25, 1912, provides for making a channel between Bissetts and Oldbridge 6 feet deep at mean low water of the same width, 100 feet, proposed under the 4-foot project, at an estimated cost of $87,000, in accordance with report printed in House Document No. 520, Sixty-second Congress, second session. It is expected to carry out this addition to the project without increasing the cost of the improvement as originally submitted, except for maintenance, which is now estimated at $8,000.

The maximum draft that could be carried to South River or Washington on June 30, 1912, was about 8 feet, thence to Bissetts, 5 to 6 feet, at mean low water. Mean range of tides: At canal, 5.34 feet; at Oldbridge, 4.57 feet.

Large brickyards established along the banks of the river give it a commercial importance out of proportion to its size.

The commerce is principally in brick, sand, clay, coal, fertilizer, and general merchandise, and amounted in 1899 to 343,202 tons; in 1902 to 387,246 tons; in 1904 to 392,626 tons; in 1905 to 260,204 tons, valued at $1,046,208; in 1906 to 226,227 tons, valued at $972,550; in 1907 to

118,549 tons, valued at $477,530; in 1908 to 99,197 tons, valued at $472,013; in 1909 to 133,587 tons, valued at $439,914; in 1910 to 127,170 tons, valued at $431,061; and in 1911 to 127,024 tons, valued at $480,411. Tonnage reported since 1907 in short tons; previous reports in long tons.

The improvement has caused a great reduction in freight rates, and it appears probable that the rates will be further reduced when the improvement reaches the upper stretches of the river. From reliable information received it appears that as a result of this improvement a reduction in freight rates on fire brick by rail to Boston of from $3.25 to $2 per ton has been made. The freight rate by rail to New York is $1.60 per ton; by water it is 75 cents per ton.

It is proposed to apply the amount recommended to be appropriated to maintaining the improvement in accordance with the adopted project.

(*e*) *Shoal Harbor and Compton Creek.*—This harbor is on the south shore of Raritan Bay, 5 miles from Sandy Hook. Compton Creek is a narrow stream emptying into it. The natural harbor for boats in Compton Creek is inside the mouth of the creek, where the depth is from 3 to 4 feet at mean low tide. The creek is navigable for about 1 mile above its mouth, where it is crossed by a railroad bridge without a draw. One-fourth of a mile above its mouth it is crossed by a highway drawbridge.

The entrance to this harbor was originally obstructed by a broad flat shoal on which there was a depth of less than 1 foot at mean low tide, the distance between the deep water in the creek and the 4-foot depth in the bay being about one-half mile.

The original and existing project, adopted September 19, 1890, proposes a channel 4 feet deep connecting Compton Creek with Raritan Bay, the width to be 150 feet in the bay and 75 feet in and near the mouth of the creek, the channel through Shoal Harbor to be protected by a dike if necessary, at an estimated cost of $64,130.

The amount expended to June 30, 1912, was $48,491.27, of which sum $17,000 was applied to carrying out the project and $31,491.27 for maintenance. About three-fifths of the dredging contemplated under this project has been completed, and a 4-foot channel 75 feet wide has been dredged through Shoal Harbor and Compton Creek, about two-thirds of a mile in length, connecting Raritan Bay with Compton Creek.

The maximum draft that could be carried June 30, 1912, in the improved channel through Shoal Harbor and Compton Creek to the drawbridge was about 4 feet at mean low water. Mean range of tides, 4.5 feet.

The commerce of this locality in farm and fish products, fertilizers, and general merchandise amounted to 180,000 tons in 1901; to 48,790 tons in 1902; to 65,175 tons in 1903; to 34,340 tons in 1905, valued at $1,198,200; in 1906 to 34,538 tons, valued at $1,167,920; in 1907 to 62,895 tons, valued at $1,809,380; in 1908 to 82,262 tons, valued at $1,510,210; in 1909 to 37,761 tons, valued at $490,975; in 1910 to 54,979 tons, valued at $999,895; and in 1911 to 61,702 tons, valued at $612,500. Tonnage reported since 1907 in short tons, previous reports in long tons.

It appears from statements received from shippers that there has been a reduction on coal freights of 40 per cent, on manure from 40 to 50 per cent, and on fish 20 per cent, as a result of this improvement, and if the improvement is not continued the rates would be very much advanced.

It is proposed to apply the available balance and the amount recommended to be appropriated to maintenance of the project.

(*f*) *Cheesequake Creek.*—This is a small stream in the eastern part of New Jersey which discharges into Raritan Bay, about 2 miles east of South Amboy. Before improvement by the United States the available navigable depth in the creek was 1½ feet at mean low water over the shoals, the distance from the entrance to the upper limit of navigation being 3½ miles.

The existing project was adopted June 14, 1880, and provided for a new outlet, 5 feet deep, from the creek into Raritan Bay, at right angles to the shore line through a beach which put across the mouth of the creek from the right bank and which had forced the outlet nearly one-half mile to the westward. This was to be obtained by dredging and constructing parallel jetties of stone, 200 feet apart, on each side of the dredged channel; the old outlet was to be closed by a pile dike, and a channel, 4 feet deep at mean low water and from 50 to 100 feet wide, was to be dredged from the mouth to the head of navigation, 3½ miles up the creek. In this distance two dikes were to be built and a new channel to be made through the marsh was to cut off a bend in the creek. Stump Creek, a tributary stream emptying into the creek near its mouth, was to be improved by dredging a channel 50 feet wide and 3 feet deep.

The cost was estimated at $75,279, which was revised in 1885 to $90,000.

The amount expended on the present project up to the close of the fiscal year ending June 30, 1912, was $53,810.25, of which $40,000 was used in carrying out the project, and $13,810.25 in maintenance. Of this amount $1.25 was derived from the sale of maps. About four-ninths of the work contemplated under this project has been completed, and the work accomplished consists of the construction of the two parallel stone jetties at the mouth, the dredging of a 5-foot channel between them about one-third mile in length connecting the creek with the 5-foot curve in Raritan Bay, and the construction of the pile dike closing the old outlet.

The improvement has not advanced sufficiently to affect freight rates. It is proposed to expend the available balance, the allotment from appropriation of February 27, 1911, and amount recommended to be appropriated, in maintenance of the improvement.

The maximum draft at mean low water that could be carried through the mouth of the creek on June 30, 1912, was about 5 feet; mean range of tides, 5 feet.

The commerce of the creek is principally in fertilizer, sand, brick, clay, and farm produce, and amounted in 1886 to about 50,000 tons; in 1905 to 45,500 tons, valued at $146,050; in 1906 to 83,648 tons, valued at $625,000; in 1907 to 89,500 tons, valued at $263,100; in 1908 to 79,520 tons, valued at $209,550; in 1909 to 61,880 tons, valued at $178,900; and in 1911 to 36,500 tons, valued at $277,500. Tonnage reported since 1907 in net tons; previous reports in gross tons.

Amount (estimated) required to be appropriated for completion of existing project	$482,642.68
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	33,500.00

RARITAN BAY, N. J.

This bay is a large body of water lying between the southern end of Staten Island and the New Jersey shore and lower New York Bay on the east. Its greatest width north and south is about 5 miles, and its greatest length east and west is about 7 miles. The Raritan River empties into it at its west end between Perth Amboy and South Amboy, and the Arthur Kill or Staten Island Sound extends northward from its west end connecting it with Newark Bay.

This bay had naturally a fairly straight channel, 11 feet deep, to South Amboy. The line of the deepest water, however, followed the Staten Island shore from Perth Amboy to Seguine Point, where it was separated from deep water in the eastern part of the bay by a shoal 1.5 miles broad, with a minimum depth of 14.5 feet.

The original and existing project, adopted March 3, 1881, and extended September 19, 1890, and June 3, 1896, provides for dredging channels 300 feet wide and 21 feet deep from Seguine Point to deep water in the bay, a distance of about 1.5 miles, through two shoals opposite Wards Point, 0.4 and 0.6 mile long, respectively, and from South Amboy to deep water near Great Beds Light, a distance of about 1.5 miles. The estimated cost of the work was $507,875, and $20,000 annually for maintenance.

The amount expended on the work up to the close of the fiscal year ending June 30, 1912, was $618,015.72, of which $297,314.45 was used in carrying out the project, and $320,701.27 for maintenance. The existing project has been completed, and the work now contemplated is maintenance of the improvement.

It is proposed to apply the available balance and the amount recommended to be appropriated to maintenance of the improvement.

The maximum draft that could be carried June 30, 1912, through the Wards Point, South Amboy, and Seguine Point Channels was about 20–21 feet at mean low water. Mean range of tides 5 feet.

The commerce of the bay is mainly in coal, brick, refined lead, and copper, bullion, clay products, and general merchandise, and amounted in 1901 to 4,722,048 tons; in 1902 to 5,453,122 tons; in 1903 to 4,484,152 tons; in 1905 to 5,296,986 tons; in 1906 to 6,432,245 tons, valued at $114,358,610; in 1907 to 7,424,414 tons, valued at $139,228,344; in 1908 to 8,729,748 tons, valued at $136,550,115; in 1909 to 8,283,839 tons, valued at $107,829,053; in 1910 to 9,168,913 tons, valued at $132,234,295; and in 1911 to 10,078,774 tons, valued at $149,933,596. Tonnage before 1908 reported in long tons; since reported in short tons.

It appears from statements of the shipping interests of the great railroad terminals that the improvements have resulted in a reduction of towing rates and a proportionate reduction of freight rates, owing to the greater quantity of coal that can be carried and towed through these channels over that which was carried before the improvement was made.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$20,000

ABSECON CREEK, N. J.

This is a new project, for which provision is made in the river and harbor act of July 25, 1912, in accordance with the report printed in House Document No. 71, Sixty-second Congress, first session.

Absecon Creek is a tidal stream on the eastern shore of New Jersey and empties into Absecon Bay about 5 miles northwest of Atlantic City. The creek is about 3 miles long, 80 to 100 feet wide, and had when last examined a prevailing depth of from 10 to 15 feet, except just below the highway bridge, where there is an obstruction, presumably the ruins of a draw. The range of tide is about 4 feet.

The project is based on a survey made in 1910, and provides for a channel 5 feet deep at mean low water and 50 feet wide from Absecon to the mouth of the creek, thence 80 feet wide across Absecon Bay to the head of Absecon Bay Channel, including a turning basin at Absecon, at an estimated cost of $15,000, with $1,600 annually for maintenance after completion.

It is proposed to expend the funds recommended below in dredging for maintenance of the improvement.

Amount appropriated by river and harbor act approved July 25, 1912......	$15,000
Amount available for fiscal year ending June 30, 1913......................	15,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement..	1,600

ALLOWAY CREEK, N. J.

This is a tidal tributary of the Delaware River, flowing westerly in the southwestern part of New Jersey, its mouth being about 50 miles below Camden, N. J. In its original condition the creek was obstructed between its mouth and Quinton, a distance of about 10 miles, by shoal areas in the upper half of the stream, which reduced the low-water depths to from 1.3 to 4 feet.

The project was adopted by the river and harbor act of September 19, 1890, and is based upon a survey made in 1889, report on which is printed in the Annual Report of the Chief of Engineers for 1890, page 906, and in House Executive Document No. 60, Fifty-first Congress, first session. It contemplates the formation by dredging of a channel 6 feet deep at mean low water and 60 feet wide from Quinton to a point about 1,000 feet above upper Hancock Bridge; thence a channel of the same depth and 75 feet wide to a locality known as the "Square," where the work was to be supplemented by a dike. At a locality known as the "Canal," in addition to a channel of the last-named dimensions, the width of the stream was to be increased to about 150 feet between its low-water lines. The project was modified on December 10, 1896, so as to provide for a dike formed by a single row of piles above upper Hancock Bridge. This modification did not increase the originally estimated cost of the work, which is $25,000.

Channels from 40 to 75 feet wide and 6 feet deep at mean low water have been dredged at various localities, and dikes 300 and 404 feet in length, respectively, have been constructed at the "Square" and above upper Hancock Bridge. The channel has been dredged not less than 75 feet wide and 6 feet deep from the mouth to a point one-half mile below Hancock Bridge, and thence 60 feet wide and

6 feet deep to the upper end of a shoal just above Hancock Bridge, a distance of 4.92 miles. This work extended to January, 1908.

The river and harbor act of March 2, 1907, appropriated $5,000 for continuing improvement and maintenance, and authorized a sufficient amount thereof to be applied to the construction of a cut-off at Fosters Bottle, with the proviso that no expenditure should be made thereon until all land needed for such cut-off should be deeded to the United States free of expense. This title was obtained, and under a contract the cut-off at Fosters Bottle was made, and resulted in a straight channel through it of a minimum depth of 7 feet at mean low water and a bottom width of at least 75 feet, 1 foot overdepth and side slopes having been allowed in accordance with the contract. This completed the project.

With $5,000 allotted from the appropriation for preservation and maintenance of river and harbor works, act of March 3, 1909, a contract was made for dredging, and under it the channel was dredged at various points in 1910 between the mouth and Quinton, the depth made being 6 feet at mean low water and the bottom widths 75 feet to upper Hancock Bridge and 60 feet thence to Quinton; and with funds provided by the river and harbor act of June 25, 1910, and February 27, 1911, the channel was redredged and the remains of 200 linear feet of fallen dike just above upper Hancock Bridge removed in 1911, resulting in a channel not less than 75 feet wide at bottom and not less than 6 feet deep at mean low water from the mouth to a point 1,000 feet above upper Hancock Bridge, and not less than 60 feet wide at bottom and 6 feet deep at mean low water thence to Quinton.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the stream under improvement was 5 feet to Quinton, the head of navigation. The mean range of tide is 6 feet at the mouth and 4 feet at Quinton.

The amount expended on this improvement to June 30, 1912, was $42,017.30, of which $20,619.57 was for maintenance.

The commerce for the calendar year 1911 is reported to have been 17,149 tons, valued at $482,950.

The freight rates are reported to have been lowered by reason of the improvement of the creek, but to what extent is not stated. Larger boats are enabled to enter and depart, and shipments have been facilitated very much by avoiding delays in waiting for tides.

It is proposed to expend the funds recommended below in dredging for maintenance to keep the channel available for navigation.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

COOPER CREEK, N. J.

This creek enters the Delaware River in the city of Camden, just above Cooper Point. It was navigable at mean high water for a distance of 9 miles from its mouth for vessels drawing 5 feet, and for the first five miles for vessels of 11½ feet draft. For a distance of 1½ miles from the mouth the width of the stream averaged about 80 feet at low water and about 120 feet between the banks, and the channel in its original condition had a depth at mean high water of from 12 to 15 feet, except at one place where the depth was 9½ feet.

The project for this improvement was adopted in the river and harbor act of June 3, 1896, and is printed in House Executive Document No. 176, Fifty-third Congress, third session, and in the Annual Report of the Chief of Engineers for 1895, page 1102. It provides for the formation, by dredging, of a channel 70 feet wide on the bottom and 18 feet deep at mean high water (12 feet at mean low water) from the mouth of the creek to Browning's Chemical Works and a channel of the same dimensions through the bar just outside the mouth—in all, a distance of about 9,000 feet. The estimated cost, including contingencies, is $35,000.

The river and harbor act of June 3, 1896, appropriated $37,000 for completing this improvement, of which $2,500, or as much thereof as might be necessary, was to be expended in rebuilding the dike on the Government reservation in the Delaware River at Woodbury Creek.

The sum of $2,500 was expended in rebuilding the dike at Woodbury Creek referred to, and the channel in Cooper Creek was dredged in 1898 and 1899. This dredging resulted in the formation of a channel extending from the mouth to the Camden Iron Works, 7,500 feet long, 50 to 70 feet wide, except at the bridges, where the widths are 30 feet, and 18 feet deep at mean high water (12 feet at mean low water). At State Street the depth made was only 14 to 15 feet on account of a city water main crossing the stream at that depth. Further operations were suspended to await the lowering of this pipe, which was contemplated by the city.

In 1906, to meet the wants of the traffic in the creek, the channel was dredged between the State Street Bridge and the 12-foot contour in the Delaware River to a depth of 12 feet at mean low water and a width of 70 feet. The lowering of the pipe at State Street was completed in September, 1907.

With an allotment of $5,000 from appropriation of March 3, 1909, and the available balance of funds, the channel was dredged between December, 1909, and March, 1910, resulting in a continuous channel not less than 12 feet deep at mean low water from the 12-foot curve in the Delaware River upstream to within 160 feet of the upper boundary line of the Camden Iron Works, a distance of 8,635 feet, the width made being not less than 70 feet, except on a stretch of 600 feet from a point 400 feet below the State Street Bridge to 200 feet above that bridge, and a stretch of about 1,600 feet from a point just above the Federal Street Bridge, downstream, where a channel 12 feet deep and from 20 to 60 feet wide was found. On the stretch at the State Street Bridge, the full width of the draw, 49.5 feet, was found through the draw opening and its approaches.

Between December, 1911, and April, 1912, the channel was dredged from a point opposite the foot of Eleventh Street to a point about 900 feet above Federal Street Bridge to a depth of not less than 12 feet at mean low water and a bottom width of not less than 70 feet, except at the bridges, where the widths were made to conform to the draw openings.

About 70 per cent of the project work has been completed.

The amount expended on this improvement to June 30, 1912, is $51,628.74, exclusive of the $2,500 expended in rebuilding dike at Woodbury Creek. Of this amount $24,952.64 was for maintenance.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 12 feet from the Delaware River to the Camden Iron Works and 6½ feet thence to Browning's Chemical Works. The stream is navigable nearly to the Medford Branch of the Pennsylvania Railroad, a distance of 9 miles, for boats drawing from 2 to 3 feet of water. The mean range of tide at the mouth is about 6 feet.

The commerce for the calendar year 1911 is reported to have been 267,244 tons, valued at $3,221,211.62.

The effect of the improvement made in this stream on freight rates has been to reduce them by permitting larger vessels to be secured for long voyages than was possible formerly. The railroad rates to points in the United States east of Cape Cod are 25 per cent higher than by water.

The river and harbor act of June 25, 1910, provides for an examination and survey of Cooper Creek with a view to an increased depth and an extension of the project. These have been made, but report on the survey is deferred pending action on proposed harbor lines.

It is proposed to expend the amount recommended below in dredging on the project and for maintenance.

Amount (estimated) required to be appropriated for completion of existing project	$1,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	5,000

ELIZABETH RIVER, N. J.

The following are extracts from a report on a recent examination printed in House Document No. 750, Sixty-second Congress, second session:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, May 9, 1912.

SIR: I have the honor to submit herewith, for transmission to Congress, reports dated May 25, 1911, and March 16, 1912, by Col. W. T. Rossell, Corps of Engineers, on preliminary examination and survey, respectively, of Elizabeth River, N. J., with a view to providing a channel of sufficient depth from the Broad Street Bridge to the channel in Staten Island Sound, authorized by the river and harbor act approved June 25, 1910.

The existing project for improvement of Elizabeth River on which expenditures since 1897 have been for maintenance only, provides for dredging a channel 60 feet wide and 7 feet deep at mean high water (about 3 feet at mean low water), up to Broad Street, Elizabeth, about 2¾ miles above the mouth.

Owing to the foul condition of the river due to the sewage flowing into it from the city of Elizabeth, the district officer expressed the opinion in his report on preliminary examination that the locality was unworthy of improvement by the General Government. From representations made before the Board of Engineers for Rivers and Harbors, it appears that this condition has now been at least partially alleviated by the diversion of the greater part of the sewage and that the locality would be willing to cooperate in any improvement of the stream.

The district officer who is also the division engineer submits an estimate for dredging a channel 6 feet deep at mean low water (about 10 feet at mean high water), and 60 feet wide on bottom from Arthur Kill to Broad Street, Elizabeth, at an estimated cost of $151,030, and $5,000 annually for maintenance. He is of opinion that Elizabeth River as a whole is not worthy of improvement by the General Government and suggests a division of cost of the project by which the cost of the work below the New York & Long Branch Railroad bridge, 1 mile from the mouth, will be borne by the United States and that above, if undertaken at all, by the city of Elizabeth. Under this plan the estimated cost to the United States would be $15,443.50, and to the city $135,586.50, and improvement to this extent by the United States is recommended by the district officer.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated April 1, 1912. The board concurs with the district officer in recommending that a channel 6 feet deep at mean low water and 60 feet wide on the bottom be dredged by the United States as far up as the New York & Long Branch Railroad bridge, provided that no work shall be done until local interests furnish free of cost to the United States suitable places for the deposit of dredged material, and also release the United States from all claims for damages due to possible sloughing of the banks incident to the contemplated dredging.

After due consideration of the above-mentioned reports, I concur in general with the views of the district officer and the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of Elizabeth River, N. J., up to the New York & Long Branch Railroad bridge, 1 mile above the mouth, is deemed advisable so far as to secure an available channel depth of 6 feet at mean low water and a width of 60 feet on bottom at an estimated cost of $15,443.50 for first construction, provided that no work shall be done by the United States until local interests furnish, free of cost, suitable places for the deposit of dredged material, and also release the United States from all claims for damages due to possible sloughing of the banks incident to the contemplated dredging. This estimate is based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of the entire estimated cost.

Very respectfully,

W. H. BIXBY,
Chief of Engineers, U. S. Army.

The SECRETARY OF WAR.

It appears from the report of the district officer that the most valuable part of the commerce of the stream is below the New York & Long Branch Railroad bridge, the upper limit suggested for improvement by the United States. Above this bridge the commerce amounts annually to about 10,000 short tons, with a value of about $25,000.

It was reported in 1879 that the commerce of the river, which was 125,000 tons in 1870, had dropped to 36,800 tons when the improvement was commenced. Subsequent reports give commerce as 21,650 tons in 1895; 28,865 tons in 1897; 29,495 tons in 1901; 40,250 tons in 1902; 36,336 tons in 1904; 28,887 tons in 1905, valued at $247,717; in 1906, 43,255 tons, valued at $352,784; in 1907, 20,053 tons, valued at $87,322; in 1908, 31,825 tons, valued at $190,298; and in 1909, 30,242 tons, valued at $217,877. Tonnage reported since 1907 in short tons, previous reports in long tons.

HACKENSACK RIVER, N. J.

The Hackensack River rises near Haverstraw, Rockland County, N. Y., and flows south, emptying into the head of Newark Bay, about 34 miles in a direct line from the source. The river is tidal and navigable to New Milford, about 20 miles from the mouth, where navigation is cut off by low dams of the Hackensack Water Co. Navigation above Hackensack is limited to boats of light draft. The lower part of the watershed is occupied by tidal meadows about 4 miles wide and 10 miles long; these meadows are but a few inches above the level of high tide. The principal navigable tidal tributaries of the Hackensack River are Overpeck Creek from the east at Little Ferry, 13 miles from the mouth, and Berrys Creek from the west, about halfway between Little Ferry and the mouth of the river. These tributaries are crossed by drawbridges and are navigable for distances of about 3½ miles from the Hackensack River. The river has very little slope between the mouth and Hackensack. The mean range of tide is about 4¾ feet at the mouth, and about 5 feet at Hackensack.

In its original condition the mouth of the river was obstructed by bars extending from the junction with the Passaic River to the Newark and New York railroad bridge, a distance of about a mile, which limited practical navigation to a depth of about 8 feet at mean low water. After crossing these shoals near the mouth of the river there was a depth of 12 feet and over to Little Ferry. From Little Ferry to Hackensack the limiting depth was from 5 to 6 feet at mean low water.

The project for the improvement of the Hackensack River, adopted by the river and harbor act approved July 25, 1912, is in accordance with plan printed in House Document No. 643, Sixty-first Congress, second session, and provides for making and maintaining, by dredging, a channel 12 feet deep at mean low water; the width to be 200 feet from Newark Bay to Little Ferry, thence 150 feet to the New York, Susquehanna & Western Railroad bridge, at an estimated cost of $171,018.10, and $6,000 per annum for maintenance.

There has been nothing expended on this work as yet, or any operations during the fiscal year.

The commerce of this river, mainly in coal, building material, and clay products, amounted in 1911 to 314,256 short tons, valued at $1,623,342.

It is proposed to supply the amount appropriated and the amount recommended to be appropriated to carrying out the improvement.

Amount (estimated) required to be appropriated for completion of existing project	$121,018.10
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	50,000.00

MANTUA CREEK, N. J.

Mantua Creek is a stream flowing into the Delaware River at a point about 10 miles below the terminal and ferry of the Pennsylvania Railroad at Camden, N. J.

In its original condition it was navigable at high water for a distance of one-half mile above its mouth to the phosphate works of the I. P. Thomas & Sons Co. for vessels of 13 feet draft; thence 3¼ miles farther to Paulsboro, for vessels drawing 9 feet; thence 3¼ miles to Parkers Landing for tugs and barges drawing 6 feet, this being the head of steam navigation; thence 4.1 miles to Mantua, 11¼ miles above the mouth, small boats and barges of 3 to 4 feet draft passed up on the tide. The navigable portion is generally bordered by low ground, protected from overflow by earthen banks. The general course of the stream is tortuous, and its navigation was much obstructed by bars, sharp bends, and the upper portion by stumps and overhanging trees. The stream, on account of its flat watershed, is subject to only moderate freshets, which seldom exceed 2 to 3 feet above tide water. The low-water width near the mouth averaged 160 feet, decreasing to about 100 feet at Paulsboro. Above Paulsboro the width decreased to 88 feet at Parkers Landing, and near Mantua to 50 feet.

In 1889 a channel 8 feet deep at mean low water and from 60 to 70 feet wide was dredged, extending from deep water in the Delaware River to the phosphate works.

The approved project for the improvement, which was adopted by Congress in river and harbor act of March 3, 1899, is based upon a survey made in 1897 and printed in the Annual Report of the Chief of Engineers for 1898, page 1122, and in House Document No. 123, Fifty-fifth Congress, second session. It contemplates the dredging of a channel 100 feet wide on the bottom and 12 feet deep from the 12-foot contour in the Delaware River through the marsh to the phosphate works, a distance of 2,200 feet, thence 80 feet wide on the bottom and 8 feet deep, to Paulsboro, 6,300 feet, making a channel nearly direct by cutting off three bends; thence to Parkers Landing near Berkley, 3 miles, with one cut-off 60 feet wide and 7 feet deep; and the dredging of a cut-off 350 feet long, 50 feet wide, and 3 feet deep, 9,000 feet above Berkley; also the removal of overhanging trees above Berkley and the construction of jetties on both sides at the mouth of the creek. The estimated cost of this improvement is $145,030. Such lands and rights as were considered necessary for the cut-offs were purchased in September, 1900, at a cost of $8,000.

Between 1901 and 1905 the channel between the phosphate works and Paulsboro was dredged to the project dimensions and the three cut-offs made as planned, and a channel 12 feet deep at mean low water dredged direct from the 12-foot contour in the Delaware River to the phosphate works, cutting off the old mouth, the width made being 110 feet across the flats and 100 feet at the upper and lower ends of the dredging.

For the protection of the channel at the mouth a jetty 754 feet in length was constructed in 1907 on the east side of the channel, and a jetty 579.5 feet on the west side, and a dike, 524 feet long, to close the old mouth of the river.

During the fiscal year 1909 the channel was dredged to a depth of 13 feet at mean low water and a width of 100 feet from the 12-foot curve in the Delaware River to the upper end of the I. P. Thomas & Sons' fertilizer works, thence 9 feet deep and 80 feet wide to the highway bridge at Paulsboro, and thence a distance of 12,000 feet 8 feet deep and 60 feet wide, these depths including 1 foot for overdepth allowed under the contract. The portion of this work below the Paulsboro highway bridge was maintenance work.

The amount expended on the improvement to June 30, 1912, is $98,998.57, of which $95,998.57 is on the present project. Of the latter amount $9,464.03 was for maintenance.

About 55 per cent of the project has been completed.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 12 feet from the Delaware River to the phosphate works, 7 feet thence to Paulsboro, 6 feet thence for a distance of 12,000 feet, and thence 2 feet to Mantua. The range of tide is 6 feet at the mouth, 4.5 feet at Paulsboro, 3.4 feet at Berkley, and 2 feet at Mantua, which is the head of navigation.

The commerce of the river, which is quite varied, is reported to have been 170,444 tons, valued at $2,149,470 for the calendar year 1911.

It is proposed to expend the amount recommended below in dredging toward the completion of the project and in maintenance to keep the improvement available for navigation.

The river and harbor act of March 3, 1909, provided for an examination of Mantua Creek, with a view to continuing improvement to the head of navigation, and report thereon will be found in House Document No. 523, Sixty-first Congress, second session.

Amount (estimated) required to be appropriated for completion of existing project	$30,783.18
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	15,000.00

MAURICE RIVER, N. J.

This is a new project, which was adopted by the river and harbor act of June 25, 1910. It is based upon a survey made in 1905, report upon which is printed in House Document No. 664, Fifty-ninth Congress, first session, and contemplates securing a channel depth of 7 feet at mean low water across the bar at the mouth of the river and in the river to the head of navigation at Millville, including a turning basin at the upper end, the width to be 100 feet to Millville Bridge and 60 feet wide thence to the milldam, at an estimated cost of $156,200.

This river has been under improvement since 1885, when operations were commenced under a project approved in 1882 providing for a channel 6 feet deep at mean low water through the 4 miles below Millville Bridge and 4 feet deep along the wharves of the city. A modification of the project, made in 1890, contemplated the 6-foot depth to the upper limits of the project, and one made in 1892 provided for extending this depth for a further distance of 500 feet with a width of 50 feet. This was completed in 1892 at a total cost of $43,000.

With the $25,000 appropriated by the river and harbor act of June 25, 1910, the channel was dredged in 1911 from Frenchs Bar upstream to the drawbridge at Millville to a bottom width of 100 feet and a depth of 8 feet at mean low water, which included 1 foot over depth made and allowed under the contract. Below Frenchs Bar there was a fairly good depth of water, except outside the mouth, where the depth was 5 feet at mean low tide.

About 15 per cent of the project work has been completed.

The amount expended on this improvement to June 30, 1912, is $65,790.77, of which $43,000 was on a previous project and $22,790.77 on the present project, no part of which was for maintenance.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the river under improvement to Millville was about 5 feet over the bar at the mouth and 7 feet in the river.

The average rise and fall of the tide is about 6 feet at the mouth and a little over 5 feet at Millville, the head of navigation. The distance to the mouth is 24 miles.

It was impracticable to obtain commercial statistics for the calendar year ending December 31, 1911.

It is proposed to expend the amount requested below in dredging, in continuation of the project.

Amount (estimated) required to be appropriated for completion of existing project	$111,200
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	30,000

NEWARK BAY AND PASSAIC RIVER, N. J.

Passaic River is a stream of considerable size rising among the highlands in the northern part of New Jersey and flowing in a generally easterly and southerly course into Newark Bay. It is navigable from its mouth to Passaic, a distance of about 16 miles, where navigation is cut off by the Dundee Water Power & Land Co.'s dam. In its natural condition the navigable depth to Newark was about 7 feet at mean low water; from Newark to Passaic it was about 3 feet.

The first project for improvement, now existing in part, adopted by the river and harbor act of June 10, 1872, was for providing a channel, by diking and dredging, from Newark to Passaic from 6 to 7½ feet deep and from 50 to 200 feet wide, the first cost being estimated at $123,924. This was subsequently increased to $193,822. Up to June 30, 1912, $222,466.65 had been expended on this project, of which $150,734 was expended for improvement and $71,732.65 for maintenance work. The annual cost of maintenance is estimated at $5,000. This project is practically completed, a depth of 6 feet at mean low water and width of about 100 feet having been obtained.

The second project, now covered by third project, was for improving the river below Newark and was authorized by the river and harbor act of June 14, 1880, at an estimated cost of $353,875. It contemplated a channel 200 feet wide and 10 feet deep at mean low water up to Center Street Bridge, Newark.

The two projects (first and second) were consolidated by the river and harbor act of July 13, 1892, the estimated cost of the improvement being $547,697.

The amount expended under this consolidated project up to the close of the fiscal year ending June 30, 1912, was $512,293.19, of which $389,610 was used in carrying out the projects and $122,683.19 for maintenance.

The third project, adopted by the act of June 13, 1902, in accordance with the report submitted in House Document No. 401, Fifty-sixth Congress, first session, provides for making a channel from Staten Island Sound through Newark Bay and the said river to the Montclair & Greenwood Lake Railroad bridge, 200 feet in width, 12 feet deep to the Nairn Linoleum Works, and 10 feet deep from that point to the said railroad bridge, a total distance of 10.8 miles. The estimated cost was originally $296,000, but was subsequently increased, additional funds having been appropriated by the river and harbor act of March 3, 1905, and may now be stated at $323,274.60. Work under this project was authorized to be done under continuing contracts, the total amount of the contract authorization being now appropriated. The amount expended on this project up to the close of the fiscal year ending June 30, 1912, was $301,467.75, of which amount $127.96 was derived from sale of maps. This project was completed in 1911. It will be maintained until work under the fourth project covers the locality.

The fourth and existing project was adopted by the river and harbor act approved March 2, 1907, and it provides for making a channel 16 feet deep at mean low water 300 feet wide from deep water in Newark Bay to the Nairn Linoleum Works, 9.7 miles, thence 200 feet wide to the Montclair & Greenwood Lake Railroad bridge, 1.1 miles, in accordance with the report submitted in House

Document No. 441, Fifty-ninth Congress, second session, estimated to cost $1,216,775. The act provided for an expenditure of $850,000 for prosecuting the work, of which $142,000 is yet to be appropriated under continuing-contract authorization. The amount expended on this project to the close of the fiscal year ending June 30, 1912, was $513,008.49, of which amount $2.40 was derived from sale of maps.

The river and harbor act of February 27, 1911, provided that the project for improvement below said bridge may, in the discretion of the Secretary of War, be so modified as to allow the widening of the channel at the bends where considered desirable in the interest of commerce and navigation; also that the cost of the project shall not be increased by such additional work beyond that stated in House Document No. 441, Fifty-ninth Congress, second session.

The third and fourth existing projects will eventually be covered by a project adopted by the river and harbor act approved July 25, 1912, for increasing the depth in Newark Bay and Passaic River to the Montclair & Greenwood Lake Railroad bridge to 20 feet at mean low water, at an estimated cost of $1,064,800, in accordance with reports and estimates printed in House Document No. 707, Sixty-second Congress, second session.

During the fiscal year operations consisted in dredging under a continuing contract under project of 1907. Dredging was in progress at the beginning of the year, at which time 2,846,034 cubic yards of material had been removed. Dredging was continued through the year, and 278,965 cubic yards of material were removed. Of this amount 131,951 cubic yards were removed from the bend between the Pennsylvania Railroad freight and Jackson Street Bridges. Under this project the channel has thus far been dredged to the Bridge Street Bridge, Newark, a distance of about 8 miles from the beginning of the work in Newark Bay, with widths of from 150 to 300 feet. About three-fourths of the work proposed has been accomplished. Work was in progress at the close of the fiscal year.

The maximum drafts that could be carried June 30, 1912, were as follows: 16 feet in Newark Bay and Passaic River to Newark & New York Railroad bridge, 14 to 15 feet to Bridge Street Bridge, 12 feet to New York, Lake Erie & Western Railroad bridge, 10 feet to Montclair & Greenwood Lake Railroad bridge and 6 feet to the city of Passaic. Mean range of tides at mouth of river 4.7 feet and at Passaic 3.5 feet.

It is proposed to apply the available balance and the amount to be appropriated to continuation and maintenance of the improvement in accordance with the adopted projects.

The commerce of this river is mainly in building material, iron ore, fertilizers, coal, and general merchandise, and amounted to 2,037,363 tons in 1900; to 2,009,356 tons in 1901; to 2,494,312 tons in 1902; to 2,356,511 tons in 1903; to 2,567,942 tons in 1904; to 2,567,000 tons in 1905; to 2,577,188 tons in 1906 and 1907, valued at $167,113,305; in 1908 to 2,110,959 tons, valued at $171,612,700; in 1909 to 2,650,809 short tons, valued at $164,800,203; and in 1910 to 2,266,291 short tons, valued at $62,216,587, including the commerce of Hackensack River, which passes through Newark Bay. Tonnage reported before 1908 in long tons since reported in short tons.

This improvement is necessary to the great industrial interests and has reduced freight rates $1 a ton on coal and building materials, and its continuance is necessary to the successful carrying on of the business of this locality.

Projects of 1872, 1902, and 1907.

Amount (estimated) required to be appropriated for completion of existing projects	$508,775
Amount that can be profitable expended in fiscal year ending June 30, 1914, for works of improvement	$100,000

Project of July 25, 1912.

Amount (estimated) required to be appropriated for completion of existing project	$1,059,800
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	300,000

RACCOON CREEK, N. J.

This creek rises in Gloucester County, flows in a northwesterly direction, and empties into the Delaware River at a point nearly opposite Marcus Hook, Pa.

The approved project, adopted by the river and harbor act of June 13, 1902, is based upon a survey made in 1899, report on which is published in the Annual Report of the Chief of Engineers for 1900, page 1590, and in House Document No. 231, Fifty-sixth Congress, first session, and contemplates the formation of a dredged channel 7 feet deep and 75 feet in width at mean low water from the mouth for a distance of 1¾ miles to Bridgeport, thence a channel of the same depth and 60 feet wide to Springer's wharf, and thence a channel 5 feet deep at mean low water and 40 feet in width to the head of navigation at Swedesboro, 9¾ miles from its mouth, together with the widening of the channel around sharp bends, at an estimated cost of $102,135.

Between 1903 and 1906 a continuous channel was dredged to the project dimensions from the mouth to the highway bridge at Swedesboro, except widening at bends and the construction of the cut-off at Molonox Shoal.

The river and harbor act of March 2, 1907, appropriated $15,000 for continuing the improvement and for maintenance, and authorized a sufficient amount thereof to be applied to the making of a cut-off at Molonox Shoal, with proviso that no expenditure should be made thereon until the land needed therefor should have been deeded to the United States free of expense. This title was acquired in 1909.

For the expenditure of the $15,000 appropriated by the river and harbor act of March 2, 1907, which had been held to await title to land for the Molonox Shoal cut-off, a contract was made and under it dredging was done which resulted in a channel not less than 75 feet wide at bottom and not less than 7 feet deep at mean low water from the mouth to Bridgeport, not less than 60 feet wide and 7 feet deep from Bridgeport to Springers, and not less than 40 feet wide and 5 feet deep from Springers to Swedesboro, including the cut-off at Molonox Shoal, which latter saves about three-fourths of a mile of channel.

With the $12,500 appropriated by the river and harbor act of June 25, 1910, the channel was dredged at various points in 1911, resulting in a channel at least 7 feet deep at mean low water and 75 feet wide at bottom from the 7-foot contour in the Delaware River to the mouth; thence 7 feet deep with varying widths to Bridgeport; thence at least 60 feet wide and 7 feet deep to Springers; and thence at least 5 feet deep at mean low water and a bottom width of 40 feet to Swedesboro; a total distance of 8½ miles. The depths made included 1 foot overdepth allowed under the contract.

With the appropriation of $5,000 made by the river and harbor act of February 27, 1911, for maintenance, the channel was dredged from the fixed highway bridge at Swedesboro to the railroad bridge, the width made being not less than 40 feet at bottom and the depth not less than 7 feet at mean low water; and below the railroad bridge shoals were dredged to a depth of 7 feet to a point about 1¼ miles below or to the lower end of the first cut-off, the operations resulting in a channel not less than 40 feet wide at bottom and 5 feet deep at mean low water from the fixed highway bridge at Swedesboro to the lower end of the first cut-off, a distance of approximately 1¾ miles.

About 95 per cent of the project has been completed.

The amount expended on this improvement to June 30, 1912, is $64,283.49, of which $63,526.26 is on the present project. Of the latter amount $17,919.39 was for maintenance.

The maximum draft that could be carried on June 30, 1912, at mean low water, over the shoalest part of the locality under improvement, is 7 feet from the Delaware River to Springers and 5 feet thence to Swedesboro. The range of tide varies from 6 feet at the confluence with the Delaware River to 4.9 feet at Swedesboro, where it is considerably influenced by winds and freshets.

On account of the improvement of the stream, perishable freight is now expeditiously carried, and bulky freight by water costs only about half that by rail. The execution of the work has altered the stream by increasing the tidal range in the upper waters 1 foot, and, therefore, to effect the provisions of the project, it is necessary to do additional dredging to secure the low-water depth contemplated.

No complete statement of the commerce of the stream could be obtained. During the calendar year 1909 the commerce, as reported, was 58,107 short tons, valued at $719,750.

The project now contemplates a depth of 5 feet and a width of 40 feet between Springers and Swedesboro. This part of the project should be modified so as to permit the extension of the 7-foot channel to Swedesboro and the removal of a sharp bend above the railroad bridge at the latter place.

It is proposed to expend the funds asked for below in dredging in continuation of the improvement and for maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	$13,000

SALEM RIVER, N. J.

In 1872 the upper part of this river was separated from the lower part by a dam and was connected with the Delaware River by a canal forming two independent streams with mouths about 10 miles apart.

Prior to the adoption of the present project $17,209.34 had been expended on improvement of this stream, of which $10,000 was applied to work in Salem Cove, at the natural mouth below Salem. with which a channel 8 feet deep and 100 feet wide at low water was obtained, and $7,209.34 to improvement of the upper river in the formation of a channel 6 feet deep and 50 feet wide at mean low water up to Hoxies Landing.

The existing project was adopted by the river and harbor act of March 2, 1907, which appropriated $29,000 for completion of the improvement. It provides for dredging the lower river below Salem 100 feet wide and 9 feet deep at mean low water, amplifying at the bends so as to permit the passage of vessels 200 feet long from Delaware River up to the highway bridge over Little Salem Creek, including the removal of the stony bars in front of the city wharves and at the bend above the brickyard. The estimated cost of this work, as given by the Board of Engineers for Rivers and Harbors in report of January 16, 1907, is $29,000, subsequently increased to $38,600.

After an examination of the channel proposals were invited, in July, 1907, for the required dredging, but as only one bid was received, at 27.5 cents per cubic yard, which was considered excessive, it was rejected. Proposals were again opened in May, 1908, under more favorable conditions, the lowest bid received this time being 19.9 cents per cubic yard.

In the examination above referred to it was found that the amount of material to be excavated to obtain the project channel dimensions, with an allowance of 1 foot for overdepth dredging, would be considerably in excess of that given in the report of survey of 1897, and upon recommendation of the Chief of Engineers, the Secretary of War, in accordance with section 2 of the river and harbor act of March 2, 1907, authorized the expenditure of the available funds to the excavation of a channel of such dimensions as could be secured thereby.

Accordingly a contract for dredging was entered into, and completed April 30, 1909. The channel was dredged to a depth of 10 feet, including 1 foot for overdepth made under the contract, and a width of 100 feet from the 9-foot curve in the Delaware River to the 9-foot depth in Salem River, a distance of 7,350 feet; and from the lower part of Little Salem River to the covered bridge, a stationary structure, a distance of 2,920 feet, the channel was dredged to a depth of 9 feet at mean low water and a width of 75 feet, resulting in a channel 9 feet deep at mean low water from the Delaware River to the covered bridge, the head of navigation at Salem, a distance of about 4½ miles, the width being 100 feet in the Delaware River to inside the mouth of Salem River, widening to 200 feet at the beacon, and thence 75 feet to Salem.

With the $5,000 allotted in January, 1910, from the appropriation of $8,185,750 provided by the river and harbor act of March 3, 1909, for preservation and maintenance of river and harbor works, to be applied to maintenance of Salem River, and part of the $10,000 appropriated by the act of June 25, 1910, the channel was dredged downstream for a length of 3,575 feet from a point about 1,000 feet below the covered bridge, resulting in a channel at least 9 feet deep between the points named, the widths varying between 50 and 100 feet.

The river and harbor act of February 27, 1911, appropriated $10,600 for completing the improvement and for maintenance, and with this the channel was dredged between March and May, 1912, at various points, including the removal of the stony bars in front of the city wharves, resulting in a channel at least 100 feet wide at bottom and at least 9 feet deep at mean low water from the mouth of the river to a point about 1,000 feet above the mouth of Little Salem River, a total distance of about 3⅝ miles.

This completes the project with the exception of the stony bar at the bend above the brickyard.

The amount expended on this improvement to June 30, 1912, is $72,998.44, of which $55,789.10 is on the present project. Of the latter amount $17,189.10 is for maintenance.

The maximum draft that could be carried on June 30, 1912, at mean low water, over the shoalest part of the river under improvement was 9 feet to Salem. The range of the tide is 6 feet.

The commerce for the calendar year 1911, as reported, was 144,545 tons, valued at $10,973,960. It consists of canned goods, agricultural products, and general merchandise.

The effect of the improvement on freight rates has not been reported, but it is known that it has facilitated and expedited shipments of fruit and other perishable merchandise.

It is proposed to expend the amount recommended below in redredging the channel where necessary. In an examination made toward the close of the fiscal year it was found that the channel from the Delaware River to the mouth of Salem River had shoaled considerably, and that the cost of restoration would be $15,000 for a 9-foot depth and $10,000 for an 8-foot depth. The amount estimated below is for restoration to an 8-foot depth at the mouth and for redredging in the river.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$15,000

SHREWSBURY RIVER, N. J.

This river is a large tidal basin in the eastern part of New Jersey, and consists of two bays, each having an area of about 3 square miles, and known, respectively, as the North Branch (or Navesink River) and the South Branch, and a channel called the main stem, which unites the two branches at their eastern ends and extends northwardly to the outlet at southeast end of Sandy Hook Bay. The river is navigable on the North Branch to Red Bank, 8 miles from the mouth, where it is crossed by three bridges without draws, and on the South Branch to Branchport, 9 miles from the mouth; also to Little Silver, Oceanport, Parkers Creek, North Long Branch, and Monmouth Beach, on the several arms of the South Branch.

The part of the river which has been under improvement by the United States consists of the main stem, the North Branch to Oceanic, 5 miles from the mouth, and the South Branch to the vicinity of Seabright, about 5½ miles from the mouth. The bays above Oceanic and Seabright had sufficient water to accommodate navigation.

Before any improvement was begun by the United States the available depth to Oceanic, on the North Branch, was 3½ feet, and to Seabright, on the South Branch, it was 2½ feet; the depth in the main stem was 4 feet.

Existing project, adopted March 3, 1879, with subsequent modifications, provides for forming a channel by means of dredging and diking, 6 feet in depth at mean low water, with width of 300 feet in the main stem, and widths from 150 to 200 feet in the North Branch to Oceanic, and in the South Branch to Seabright, at a modified estimated cost of $234,062. The approved estimate for annual maintenance is $10,000.

The sum expended under the existing project to the close of the fiscal year ending June 30, 1912, was $382,663.94, of which $195,393.95 was for carrying out the project, $187,269.99 for maintenance, and $5,000 for the survey made in 1903; of the total amount expended $18.25 was derived from the sale of maps. The project is completed, 9 dikes having been built and the channel dredged to 6 feet. Dredging and dike repairs are required for maintenance of channels.

Advertisement under an appropriation of $10,000, made by the river and harbor act of February 27, 1911, for dredging, was answered by only one bid, which, being considered too high, was rejected. This work will be placed in the open market.

At the beginning of the fiscal year the channels had been practically restored to projected dimensions, but have since shoaled.

The maximum draft that could be carried June 30, 1912, throughout the limits of the improvement was 5 to 6 feet at mean low water. Mean range of tides: Outer bar, 5 feet; Highlands Bridge, 3 feet; Seabright Bridge, 1.3 feet.

The commerce of the river, mainly in coal, farm products, fertilizer, and general merchandise, amounted in 1889 to 906,000 tons; in 1902 to 657,000 tons; in 1904 to 780,290 tons; in 1905 to 1,768,500 tons, valued at $8,215,000; in 1906 to 1,668,500 tons, valued at $7,235,000; in 1907 to 1,718,125 tons, valued at $6,629,750; in 1908 to 1,854,160 tons, valued at $6,270,000; in 1909 to 1,959,920 tons, valued at $7,320,000; and in 1910 to 1,608,600 tons, valued at $6,548,000. Tonnage reported before 1908 in long tons; since reported in short tons. The passenger traffic is important, the number of people carried by the Patten Line, South Branch, in 1902, being 264,635; in 1903, 277,257; in 1904, 266,157; in 1905, 310,367; in 1909, 331,641; and in 1910, 321,875; in addition to this, 106,837 passengers were carried by the Merchants' Line in 1909, making a total in 1909 of 438,478; and 150,000 in 1910, making a total of 471,875.

It is proposed to apply the available balanceand the amount recommended to be appropriated to maintenance of the improvement in accordance with the project.

It appears from reports received from the Merchants' Steamboat Co. and the New York & Long Branch Steamboat Co. (Patten Line) that freight rates have been lowered, and maintained, as results of the improvement by the United States; also that the commerce has increased and that the improvement tends to keep the freight rates down.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement.. $10,000

TOMS RIVER, N. J.

This river is a tributary of Barnegat Bay on its western snore about 11 miles above Barnegat Inlet. The town of Toms River, the most considerable town on the river, is about 5 miles above its mouth. At the town of Toms River the stream has two forks. These were 50 to 75 feet wide. Before improvements were begun the controlling depth in the river was 5 feet at the entrance into Barnegat Bay, but above, from a point about two-thirds of a mile from the town, boats drawing over 2½ feet could not reach the public dock.

The present project, which is based upon a survey made in 1907, is printed in House Document No. 346, Sixtieth Congress, first session, and provides for dredging a channel 100 feet wide at bottom and 5 feet deep at mean low water from the highway bridge at the town of Toms River to the same depth in Barnegat Bay, at an estimated cost of $10,050 and $1,000 annually for maintenance.

The river and harbor act of June 25, 1910, appropriated $10,050 for the improvement, and with these funds the channel was dredged between April and August, 1911, upstream from the 5-foot depth in Barnegat Bay to the highway bridge at the town of Toms River, 5 feet deep at mean low water, the bottom width made being 100 feet to the junction, 40 to 50 feet on the north prong, and 40 to 80 feet on the south prong to the bridge. This completed the project.

The amount expended on the improvement to June 30, 1912, is $10,050.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the stream under improvement is 5 feet. The mean range of tide is about five-tenths of a foot.

There was little commerce during the calendar year 1911, as the channel improvement was not completed until about the middle of August.

It is proposed to apply the funds asked for below in redredging for maintenance.

Amount appropriated by river and harbor act approved July 25, 1912........	$1,000
Amount available for fiscal year ending June 30, 1913........................	1,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement..	1,000

TUCKERTON CREEK, N. J.

This is a tidal stream flowing into Little Egg Harbor, on the Atlantic coast, northeast of Atlantic City.

The original low-water depth at Tuckerton, the head of navigation, was 15 inches, which increased gradually to 4 feet at the mouth of the creek, a distance of 2 miles. From the mouth of the creek across the flats to Gaunts Point, seven-eighths of a mile, the low-water depths were 2 to 2½ feet.

The project was adopted by the river and harbor act of June 13, 1902, and contemplated the dredging of a channel 6 feet deep at mean low water and 80 feet wide from Gaunts Point, seven-eighths of a mile, to the mouth of the creek; thence a channel of the same depth and 75 feet wide, 1 mile, to Parkers Landing; thence a channel of the same depth and 60 feet wide, five-eighths of a mile farther, to West Tuckerton Landing; thence a channel 5 feet deep at mean low water and 60 feet wide for three-eighths of a mile to just above Scow Landing, and thence a channel 3 feet deep at mean low water and 40 feet wide for one-eighth of a mile to the milldam at Tuckerton, together with the widening of the channel at sharp bends; the channel across the cove between the mouth of the creek and Oyster Bed Point to be supplemented, if necessary, by a revetment wall along its northern side. The estimated cost of the work, including contingencies, is $61,380. To the end of the fiscal year 1904 the channel had been dredged to the project widths from the mouth of the river to a point 2,100 feet below the milldam at Tuckerton, the depth made being 6 feet at mean low water, except the upper 581 feet, which was dredged to 5 feet at mean low water. Under authority contained in the river and harbor act of March 3, 1905, the Secretary of War authorized the location of the channel at the mouth to be changed so as to lead it in a south-southeast direction, directly to the deep water at the head of Marchelder Channel instead of to Gaunts Point.

The river and harbor act of March 2, 1907, appropriated $12,000 for continuing the improvement, and a project for the expenditure of the appropriation was duly approved by the Chief of Engineers. This included dredging of the cut from the mouth of Tuckerton Creek to the Marchelder Channel. It was then found, however, that dredging along that line would destroy several oyster beds held and owned by private parties under leases from the State of New Jersey, and it was therefore concluded to defer operations until this matter could be adjusted.

Under date of December 16, 1907, the chief of the bureau of shell fisheries of the State of New Jersey advised this department that all objection to the proposed dredging had been removed, and thereupon contract for the dredging was entered into. The contract provided for dredging a straight channel from deep water of Marchelder Channel, off Parkers Island, across the flats of Little Egg Harbor to the mouth of Tuckerton Creek, passing through the point on the southwest side of the mouth, and then dredging, as far as the available funds would permit, the upper river, the depths to be 5 feet at mean low water from Marchelder Channel to Scow Landing, and thence 3 feet to the milldam.

The river and harbor act of June 25, 1910, appropriated $12,000, and in 1910–11 the channel was dredged from a point 4,100 feet northwest of Parkers Island, for a distance of 5,290 feet, continuing across Little Egg Harbor, through the point at the mouth of the creek, and up the creek for a distance of 400 feet. The width was made 80 feet at bottom and the depth 7 feet at mean low water, which included 1 foot overdepth made and allowed under the contract.

With the appropriation made by the river and harbor act of February 27, 1911, the channel was dredged at various points in the river from the milldam at Tuckerton down, an aggregate length of 9,880 feet, and the old mouth was closed.

The operations resulted in a channel 7 feet deep at mean low water from the mouth of the creek to West Tuckerton, approximately 70 feet wide at bottom for a length of 1,650 feet upstream from the mouth, thence 75 feet wide to Parkers Landing, and thence 60 feet wide to West Tuckerton; and from West Tuckerton the depth was made 6 feet with a width of 60 feet to Willow Landing, and thence to the milldam the depth was made 5 feet, with a turning basin 150 feet wide at the milldam. The depth included 1 foot overdepth made and allowed under the contract.

The amount expended on this improvement to June 30, 1912, is $64,648.63, of which $9,510.90 was for maintenance.

About 97 per cent of the project has been completed.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 6 feet across Little Egg Harbor, and up the creek to West Tuckerton, and thence 5 feet to the milldam. The mean range of tide is 2½ feet.

The commerce for the calendar year 1911 is reported to have been 13,975 tons, valued at $799,600.

The effect of the improvement on freight rates has not been reported.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement.. $5,000

WOODBRIDGE CREEK, N. J.

This creek is a small, crooked tidal stream about 5 miles long, running through flat marshes for most of its length and emptying into the west side of Arthur Kill, or Staten Island Sound, 2 miles north of Perth Amboy, N. J.

It is navigable for 2⅜ miles above the mouth to a point where it is crossed by a highway bridge without a draw. The width of the creek below this bridge is about 100 feet. In its original condition this stream was obstructed at its mouth by a bar having a least depth of 9.8 feet at high water and by two shoals just inside the mouth. From these shoals a good 12-foot channel at high water existed to above Anderson's brickworks, seven-eighths of a mile from the mouth, above which point, however, many shoals occurred, although a narrow 8-foot channel existed as far as Salamander Dock, 1⅞ miles from the mouth.

The existing project, printed in House Document No. 282, Fifty-sixth Congress, first session, and adopted by the river and harbor act of June 13, 1902, contemplates obtaining a channel 8 feet deep at mean low water, with a bottom width of 50 feet, by dredging, from Arthur Kill to Salamander Dock, at an estimated cost of $35,000 for the improvement and $3,000 annually for maintenance.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $54,482.43, of which $30,822.70 was used in carrying out the project, and $23,659.73 for maintenance. This project was completed in January, 1908, under appropriation of March 2, 1907.

The maximum mean low-water draft that could be carried June 30, 1912, throughout the improvement was 8 feet for nine-tenths and 6 feet for one-tenth of its length. The mean range of tides is 5 feet.

The commerce of this creek, mainly in clay, brick, tile, coal, tin scrap, steel scrap, and building materials, amounted in 1887 to 126,000 tons; in 1908 to 176,000 tons; in 1903 to 155,751 tons; in 1905 to 160,194 tons, valued at $1,018,198; in 1907 to 151,671 tons, valued at $1,071,548; in 1908 to 163,120 tons, valued at $791,700; in 1909 to 116,459 tons, valued at $587,164; in 1910 to 129,676 tons, valued at $675,000; and in 1911 to 128,560 tons, valued at $680,825. Tonnage reported since 1907 in short tons, previous reports in long tons.

It appears from inquiry that freight rates have been reduced as a result of this improvement.

It is proposed to apply the available balance, and the sum recommended to be appropriated, to maintenance of the improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement.. $3,000

WOODBURY CREEK, N. J.

Woodbury Creek rises on the boundary line between Camden and Gloucester Counties, flows in a general northwesterly direction through Gloucester County and empties into the Delaware River about 1 mile below the mouth of the Schuylkill River, Pa. Its tidal portion, flowing in a very crooked course, mostly through low marsh and meadow land, is about 5 miles in length. Navigation, however, stops at Woodbury, about 4 miles from the mouth, where the fixed bridge at Broad Street crosses the creek.

The following report of the Board of Engineers on a recent survey is printed in House Document No. 635, Sixty-second Congress, second session. The Chief of Engineers concurs in general.

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, March 5, 1912.

Respectfully returned to the Chief of Engineers, United States Army.

A survey having been made, the district officer presents a project of improvement covering the creek from its mouth to the Broad Street Bridge in Woodbury, a distance of about 4 miles, which provides for securing a depth of 6 feet at mean low water, 60 feet wide from the Delaware River to White Bridge, and 40 feet wide above, as shown on accompanying map. Estimates are presented for two plans, one following the natural course of the river, the other cutting off three bends, the amounts being. respectively, $31,600 and $38,000, the estimated annual maintenance of the former being $3,000 and the latter $2,000. It would appear therefore that in the course of a few years the cut-off plan would be the more economical.

The district officer is of opinion that this waterway is worthy of improvement by the cut-off plan, and in this view the division engineer concurs, stating, however, that no work should be done until parties interested furnish free of cost to the United States the land necessary for the cut-offs and for deposit of dredged material.

As stated in the report on preliminary examination, the commerce of the community is of a miscellaneous character, and is in excess of 136,000 tons, valued at about $2,750,000. A part of this now uses the creek and with improvement this amount would be largely increased. It is believed that the commerce is sufficient to justify the expenditure involved, and therefore the board reports that in its opinion it is advisable for the General Government to undertake the construction of a channel 6 feet in depth, 60 feet wide from the 6-foot contour in Delaware River to White Highway Bridge, and 40 feet wide from that point to Broad Street Bridge in Woodbury, including 3 cut-offs, at a total estimated cost of $38,000 and $2,000 annually thereafter for maintenance, provided the necessary right of way for the cut-offs and for the deposit of dredged material is furnished free of cost to the United States. The estimated first cost should be made available in one appropriation.

In compliance with law, the board reports that there are no questions of water power, terminal facilities, or other subjects which could be so coordinated with the project proposed as to lessen the cost thereof and compensate the Government for expenditures made in the interests of commerce and navigation.

For the Board:

W. C. LANGFITT,
Lieut. Col., Corps of Engineers,
Senior Member Present.

DELAWARE RIVER, PA., N. J., AND DEL., FROM ALLEGHENY AVENUE, PHILADELPHIA, TO THE SEA.

In its original condition the width of the channel varied greatly at different points, and obstructions reduced its depth at mean low water to 17 feet at Mifflin Bar, 18 feet at Schooner Ledge and Cherry Island Flats, and about 20 feet at Bulkhead Bar, Baker Shoal, and Duck Creek Flats. It was available for ocean-going vessels of medium draft.

The Delaware River has its sources in Greene, Schoharie, and Delaware Counties, N. Y. It flows in a general southerly direction and empties into Delaware Bay. The total length of the river is about 315 miles. The distance by water from Philadelphia Harbor to the Harbor of Refuge, Delaware Bay, is about 101 miles.

The section included in this project is about 63 miles in length and extends into Delaware Bay for a distance of about 8 miles below the mouth of the river.

Prior to 1885 efforts to improve the river were confined to dredging, except at Schooner Ledge, where solid rock was removed. The work was done under appropriations for special localities and general appropriations for the Delaware River below Bridesburg.

The first permanent and systematic improvement of this section of the river was commenced in 1885, when a project was adopted for a channel 26 feet deep at mean low water, with a width of 600 feet, from a point about one-fourth mile above Allegheny Avenue Philadelphia, to deep water in Delaware Bay.

A second project was adopted March 3, 1899. It provided for a channel 30 feet deep at mean low water, with a width of 600 feet, from Christian Street, Philadelphia, to deep water in Delaware Bay. The original work under this project was practically completed at the close of March, 1911.

A project for the improvement of Philadelphia Harbor, adopted August 11, 1888, was completed January 10, 1898, the resulting channel having a least depth of 26 feet at mean low water, except at one locality just below Cramp's shipyard, with a width varying from 1,015 to 1,850 feet extending from a point opposite Morris Street, Philadelphia, to the Pennsylvania Railroad bridge, a distance of 6.2 miles. In 1906 an allotment of $10,000 was made from the emergency appropriation contained in the river and harbor act of March 3, 1905, for redredging shoal places within the limits of this improvement. Final report on the completion of this project is printed in the Annual Report of the Chief of Engineers for 1899, page 1330, and an account of the work done under the emergency allotment in the report for 1907, page 1100. The total amount expended in this improvement, including survey of the locality and the acquisition of land, was $3,945,424.75.

The amount expended under all previous projects for improving the river below Philadelphia from 1836 to the time of taking up the existing project, exclusive of the sum expended in the improvement of Philadelphia Harbor, was $10,176,002.08.

The existing project for the improvement of this section of the river, adopted June 25, 1910, provides for a channel 35 feet deep at mean low water, 800 feet wide in the straight parts, 1,200 feet wide at Bulkhead Bar, and 1,000 feet wide at the other bends, and for the construction of dikes to control the tidal flow, at an estimated cost of $10,920,000, and an annual cost of $300,000 for maintenance, in accordance with the report published, with maps, in House Document No. 733, Sixty-first Congress, second session. No modification has been made in the existing project since its adoption.

Operations covering new work carried on under contract during the year resulted in the removal by dredging of about 3,240,000 cubic yards of material and the placing of 40,234 tons of riprap material in dikes under construction. Maintenance work with the U. S. dredges *Delaware* and *Manhattan* was in progress throughout the year, resulting in the removal of about 9,801,000 cubic yards of dredged material, and an increase of 2 feet over the prevailing depth at the close of the fiscal year 1911. The amount disbursed during the year was $845,442.36, of which $519,904.33 was for new work and $325,538.03 was for maintenance.

The total amount expended on the existing project up to the close of the present fiscal year was $1,082,001.96, of which $381,700.71 was applied to maintenance of the improvement. The sum of $805.87 was received during the year from sales of condemned property and contact print maps.

The work of dredging on Tinicum and New Castle Lighthouse ranges and dike construction in progress is being carried on under continuing-contract authorization, under which the balance remaining to be appropriated is $250,000.

The proportion of the approved project accomplished at the close of the fiscal year is about 6 per cent, and has resulted in securing an increase in width of from 200 to 600 feet and an increase in depth to 35 feet in certain sections under improvement, thereby greatly facilitating the movement of deep-draft vessels. The maximum draft that could be carried on June 30, 1912, over the shoalest part of this section of the river was 30 feet at mean low water. The mean range of tide varies from 5.3 feet at Philadelphia to 6 feet at deep water in Delaware Bay.

The gradual and systematic improvement of this section of the river and the increase in terminal facilities at the port of Philadelphia have led to the establishment during the year of three new steamship lines trading with foreign ports, and several of the old established lines have added larger and deeper draft boats to their fleet, while the number of deep-draft vessels having no regular port of call has increased. The owners of barges and canal boats trading on the river also report an increase in their fleets. The principal commodities of commerce carried on the river during the year consisted of coal, lumber, ores, iron and steel products, oils, sugar, grain, foodstuffs, and general merchandise. No change in the nature of the commerce has resulted from existing improvements. The following tabular statement shows the amount and value of commerce carried during the past 10 years:

Calendar years.	Short tons.	Value.	Calendar years.	Short tons.	Value.
1902	21,843,209	$1,621,239,450	1907	27,283,529	$1,538,385,389
1903	22,827,926	1,289,965,088	1908	24,023,895	1,249,175,518
1904	23,372,036	1,579,060,906	1909	24,677,671	1,327,869,852
1905	24,383,571	1,612,847,499	1910	25,496,213	1,340,391,894
1906	26,111,047	1,472,540,364	1911	25,786,180	1,209,879,741

The improvement has had no appreciable effect on foreign and coastwise freight rates, except that which is brought about through competition between larger and deeper draft vessels. The deeper draft vessels trading at this port are generally engaged in foreign commerce, and rates on the class of freight usually carried are largely regulated by supply and demand. Freight rates by regular steamship lines plying between points located on the section of the river under improvement average about 23 per cent lower than railroad rates between like points. Rates on freight carried by small craft on this section of the river average about 50 per cent of railroad rates.

The owners of barges engaged in transshipping report a slight decrease in freight rates owing to the increased amount of commerce moved.

In recommending the adoption of the 35-foot project the Chief of Engineers pointed out the necessity for large appropriations to permit of a rapid prosecution of the work which, in view of the large cost of maintenance, is essential to secure the increased depth desired. For the year 1914 the appropriation should be not less than $2,500,000, of which approximately one-half should be in cash; but unless continuing-contract authorization be made the appropriation should be not less than $2,000,000 in cash.

Of the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, it is proposed to apply $300,000 to maintenance of the existing channel, and the balance to new work of rock removal, dredging, and dike construction.

Amount of continuing-contract authorization, act of Feb. 27, 1911	$700,000
Amount appropriated under such authorization	450,000
Amount yet to be appropriated	250,000
Amount (estimated) required to be appropriated for completion of existing project	8,090,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 2,000,000

DELAWARE RIVER FROM ALLEGHENY AVENUE, PHILADELPHIA, PA., TO TRENTON, N. J.

In its original condition the channel was narrow and circuitous, of varying depth and width, and was available for commercial purposes by steamers and other craft of shallow draft. At Fivemile Bar, between Allegheny Avenue and the Pennsylvania Railroad Bridge, at Philadelphia, a shoal carrying from 3 to 4 feet at mean low water extended across the Pennsylvania side of the channel. There was, however, a depth of 13 feet past Fivemile Bar in the New Jersey side of the channel south of Petty Island. At Kinkora Bar, about 9 miles below Trenton, there was a shoal carrying 7½ feet at mean low water. From Bordentown to Trenton, a distance of about 5 miles, the depth of channel varied from 3 to 6 feet at mean low water.

The Delaware River has its sources in Greene, Schoharie, and Delaware Counties, N. Y. It flows in a general southerly direction and empties into Delaware Bay. The total length of the river is about 315 miles.

The section of the river included in this project is about 30 miles in length, and the distance of its lower end from the mouth of the river is about 55 miles.

Prior to 1910 no comprehensive project had ever been adopted for the improvement of this part of the river. Work had been done at various times since 1872 at different localities with a view to obtaining a depth of 7 feet at mean low water and a width of 200 feet. Under the general project for improving Philadelphia Harbor, a channel 26 feet deep was dredged through Fivemile Bar between 1888 and 1898.

The amount expended in the improvement of the Delaware River between Philadelphia and Trenton, prior to the adoption of the existing project and exclusive of the sum expended in the improvement of that part of Philadelphia Harbor north of Allegheny Avenue, was $197,623.25.

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[1] Of this amount $250,000 is for continuing contract work authorized by the act of 1911.

The exisiting project for the improvement of this section of the river was adopted June 25, 1910, and provides for a channel 200 feet wide and 12 feet deep at mean low water, at an estimated cost of $360,000 and an annual cost of $20,000 for maintenance, in accordance with the report printed, without maps, in House Document No. 702, Sixty-first Congress, second session. A map of this section of the river is published in the Annual Report of the Chief of Engineers for 1911, page 1350. No modification has been made in the existing project since its adoption.

The operations carried on under contract during the year have resulted in the removal of 472,527 cubic yards of dredged material, and the construction of 4,949 linear feet of single bulkhead dike. In addition, United States plant removed 62,334 cubic yards of dredged material. Operations during the year covered new work, no maintenance being done. Expenditures during the year amounted to $141,754.33.

The total amount expended on the existing project up to the close of the present fiscal year is $159,393.31, no part of which was applied to maintenance of improvement. The sum of $16.04 has been received from the sale of maps.

The work is being carried on under continuing-contract authorization, under which the balance remaining to be appropriated is $30,000.

About 60 per cent of the work under the approved project had been completed at the end of the fiscal year. The channel now has a least depth of 12 feet at mean low water and a width of 200 feet for a distance of about 27.7 miles. There remain about 2.3 miles of channel way to be dredged to the required width and depth, and about 1,800 linear feet of dike to be constructed to complete the work. The maximum draft that could be carried on June 30, 1912, over the shoalest part of the locality under improvement was about 7 feet at mean low water. The mean range of tide varies from 5.3 feet at Philadelphia to 4.2 feet at Trenton. The actual and natural head of navigation for steamers and other craft is at Trenton, N. J. The river is navigable above Trenton for rafting and logging for a distance of about 214 miles.

The work of improvement has not advanced sufficiently to cause any increase in commerce or to have any effect on freight rates.

It is estimated that the sum of $20,000 can be profitably expended during the fiscal year 1914 in the maintenance of the improvement.

Amount (estimated) required to be appropriated for completion of existing project	$30,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	20,000

DELAWARE RIVER, N. J., FROM LALOR STREET, TRENTON, TO UPPER RAILROAD BRIDGE.

This is a new project. In its present condition this section of the river varies in width from 1,000 to 1,500 feet, and is so obstructed by rocks and shoals as to be unfit for navigation for commercial purposes.

The Delaware River has its sources in Greene, Schoharie, and Delaware Counties, N. Y. It has a length of about 315 miles, flows in a general southerly direction, and empties into Delaware Bay. The length of the particular section included in this project is about 1 mile, and the distance of its lower end from the mouth of the river is about 85 miles.

Previous to the adoption of the present project no work had been undertaken by the United States at this locality.

The existing project, adopted by the river and harbor act of July 25, 1912, provides for the construction by dredging of a channel 200 feet wide, and 12 feet deep at mean low water, with a turning basin at its upper end of the same depth 300 feet wide and 400 feet long, along the New Jersey side of the river from Lalor Street to the upper railroad bridge, Trenton, in accordance with the report published, with map, in House Document No. 839, Sixty-first Congress, second session, and subject to the conditions recommended by the Chief of Engineers on page 2 of said document. The work proposed will require the removal of about 426,000 cubic yards of coarse and heavy material, the estimated cost of which is $164,000. No modification has been made in the existing project since its adoption.

No work was done or expenditures made during the fiscal year 1912. Trenton is the actual and natural head of navigation for vessels and other craft. The river, however, is navigable for rafting and logging for a distance of about 214 miles above Trenton. Tidewater extends as far as Trenton, and the mean range of tide at this point is 4.2 feet.

It is estimated that the sum of $114,000 can be profitably expended during the fiscal year 1914, in completing the improvement and making it available for purposes of commerce.

Amount appropriated by river and harbor act approved July 25, 1912	$50,000
Amount available for fiscal year ending June 30, 1913	50,000
Amount (estimated) required to be appropriated for completion of existing project	114,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	114,000

HARBOR AT PITTSBURGH, PA.

This harbor comprises that portion of the Ohio River lying above Davis Island Dam, a length of 4.7 miles; that portion of the Allegheny River lying between its mouth and Aspinwall, a length of 7 miles; and that portion of the Monongahela River lying between its mouth and McKeesport, a distance of 15.5 miles; total length of harbor, 27.2 miles. That portion of the harbor most used as such, and called the lower harbor, lies between the Davis Island Dam and Dams No. 1 of the Allegheny and Monongahela Rivers and measures 8 miles of river. In its original condition the lower harbor depths were from 3 to 4 feet at ordinary low water, and still lower stages occurred at times.

Since the completion of Davis Island Dam, in 1885, the maximum draft which could be carried over the shoalest place in the channel was scant 8 feet at pool stage. Parts of the channel and harbor are from 10 to 20 feet in depth. The average widths of the harbor at pool-full surfaces are: On the Ohio, about 1,100 feet; on the Allegheny, about 930 feet; and at different parts of the Monongahela, from 750 to 950 feet. The capacity of the harbor is impaired by shoal places and high dumps projecting from the banks. The use for harbor purposes of that portion of the harbor in the Allegheny River above the Sixth Street Bridge is largely nullified by the low bridges on that part of the stream. The clear heights of these bridges above their respective pool surfaces are from 27½ to 35½ feet. The least height, with chimneys down, of the packets that ply between Pittsburgh and points on the Ohio, Kanawha, and Muskingum Rivers is 45 feet. The average height of the Ohio River towboats with chimneys down, is 44 feet. The height of a suitable packet for the Allegheny River is about 33 feet, and of a suitable towboat, about 28 feet. The result is that practically none of the coal and iron or steel products intended for southern shipments have been loaded or harbored in the Allegheny River. The removal of the Union Bridge at the mouth of the river has opened up this portion of the harbor as far as the Sixth Street Bridge, a distance of about one-half mile.

In 1858 the State of Pennsylvania, through a board of commissioners, made a detailed survey of the rivers at and near Pittsburgh and laid down on the maps high and low water lines intended to define the banks and limit the use of the same by riparian proprietors. These lines were referred to stone monuments on the ground. No means, however, were provided for preserving the monuments nor for preventing the filling in the river beyond these lines.

In 1894 a board of engineer officers recommended certain harbor lines for the harbor of Pittsburgh from the Davis Island Dam to Brilliant, Allegheny River, and to Homestead, Monongahela River. The recommended lines generally followed the actual banks as they existed at that time. These lines were approved by the Secretary of War January 29, 1895. An extension of these lines on the Monongahela River from Homestead to McKeesport was approved by the Secretary of War April 3, 1902.

The original project for improvement was adopted by the river and harbor act of March 3, 1899, based on report printed in Annual Report of the Chief of Engineers for 1899, page 2399, and provided, with subsequent modifications made during the progress of the work, for dredging a channel through the lower harbor (below Dam No. 1 on the Allegheny and Monongahela Rivers) 10 feet deep at pool level and 500 feet wide below Smithfield Street Bridge, Monongahela River, and of less width above this bridge and in the Allegheny River, limited by lines from ends of channel spans of the adjoining bridges, except at the Pan Handle railroad bridge, where the dredged channel, under modified project, was to have a width of 570 feet, including two channel spans; for raising the old riprap dam across Brunot Island back channel, Ohio River; for removing abandoned structures and unauthorized and obstructive fillings projecting from the banks beyond the harbor lines; for marking of harbor lines; and for inspecting and patrolling the harbor. Appropriations aggregating $110,662.90 were made and expended on this work.

The existing project provides for maintenance of the harbor at an annual estimated cost of $5,000. The amount expended under this project to June 30, 1912, was $52,983.68, of which $5,334.19 were expended during the year for maintenance.

The principal commercial uses of the harbor are mooring of coal fleets awaiting a rise in the Ohio for proceeding to destination on that river or on the lower Mississippi, the mooring of timber rafts and boat bottoms coming down the Allegheny River on rises, the delivery of coal and other materials to mills, furnaces, steel plants and yards, and the accommodation of the several packet lines plying on the three rivers and whose routes terminate at the harbor. Besides coal, considerable quantities of steel rails, cotton ties, sheet iron, wire, nails, etc., are shipped by barges to the lower river markets.

Commercial statistics.

Calendar years.	Products.	Passengers.	Calendar years.	Products.	Passengers.
	Tons.[1]			*Tons.*[1]	
1900	8,141,451	884,415	1906	12,927,975	271,450
1901	10,916,489	817,800	1907	14,395,816	533,280
1902	12,252.405	996.500	1908	11.454,895	267,043
1903	12,240,300	702,269	1909	12,426,154	699,251
1904	9,373.448	604,477	1910	12,314,664	683,172
1905	12,269,020	603,716	1911	12,519,776	682,807

[1] 2,000 pounds.

The improvement of this harbor is so closely connected with the slack-water system of the rivers emptying into it that it might well be said that, as far as effect on freight rates is concerned, this project is one and the same as the projects for the improvement of said rivers.

The purposes for which the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied are maintenance of harbor, inspection and patrol, making local surveys, and maintenance of harbor-line markings. The work proposed is necessary to maintain the improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

ALLEGHENY RIVER, PA., OPEN-CHANNEL WORK.

The Allegheny River rises in northern Pennsylvania and flows northwestward into New York, and thence in a southerly direction into Pennsylvania to its junction with the Monongahela River at Pittsburgh. Its drainage area is about 11,580 square miles. The average fall per mile of the navigable portion is about 2.2 feet. The minimum discharge at Pittsburgh is about 1,440 cubic feet per second, and the highest measured discharge was 236,834 cubic feet per second on March 15, 1907. In its original condition the Allegheny River abounded in obstructions such as bowlders, snags, islands, bars, and wide-spreading shoals, all of which rendered navigation at best hazardous and practicable only at such stages of water as would enable craft to clear the obstructions.

The present project was adopted by the acts of March 3, 1879, and August 2, 1882, and contemplates the removal of the bowlders and snag obstructions and the construction of low dams and dikes to close secondary channels and concentrate the low-water flow on shoals.

The total amount expended up to the close of the fiscal year ending June 30, 1912, is $267,211.69, of which $1,133.01 were expended during the year for maintenance. Of this amount it is estimated that about $197,000 were applied to improvement and $70,211.69 to maintenance.

The work that has been done enables navigators to operate safely on stages from 2 to 3 feet lower than formerly.

The channel has been largely cleared of the more objectionable obstructions, but to maintain its condition it is necessary to remove any bowlders or snags brought in by the tributaries or carried along by ice and freshets, and to make occasional repairs to the dikes and dams. The depth at low water on the open river is insufficient for navigation except for short distances in the pools that lie between the shoal places.

The greatest recorded flood height is 36.6 feet at Herr Island Dam. Ordinary flood heights average about 30 feet.

Except on the lower 25 miles of the river, which are slack-watered, the principal traffic is the downstream transportation of timber and lumber rafts, new coal-boat bottoms, barges and flats, usually loaded with tan bark, lumber, posts, railroad ties, and other timber products, and the towage of gravel, stone, sand, etc. Steamboating is not now conducted to any material extent above Kittanning.

The effect of the work on freight rates is not very noticeable, as the depth of water has not been increased, but the hazard of boating has been greatly decreased.

The commerce on open river above slack-water amounted to 346,116 short tons.

The purposes for which the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied are the removal of bowlders and snag obstructions and the repair of existing dams and dikes. The work proposed is necessary to maintain the improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$2,000

ALLEGHENY RIVER, PA., CONSTRUCTION OF LOCKS AND DAMS.

Prior to the completion, in 1885, of the Davis Island Dam in the Ohio River, 5 miles below its head, it was impossible to navigate the Allegheny River with steam craft of lightest draft during low-water periods, which frequently continued for months at a time. Since then a navigable depth of 8 feet has been afforded by that dam, when raised, to Garrison ripple, 2 miles up the stream.

The original project for lock and dam construction, adopted in 1886 and subsequently extended in 1896, provided for the construction of three locks and dams which have been built and extend slack water from the mouth to Natrona, a distance of 24 miles. The river and harbor act of July 25, 1912, adopted the project printed in House Document No. 540, Sixty-second Congress, second session, for the construction of five additional locks and dams extending slack water upstream to a point about 61 miles from the mouth, at an estimated cost of $2,788,000. The act appropriates $300,000 for this work, contingent upon local interests contributing the same amount.

Following is the letter from the Chief of Engineers transmitting report on above-mentioned examination:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, February 12, 1912.

SIR: I have the honor to submit herewith, for transmission to Congress, reports dated November 11, 1911, and January 19, 1912, by Lieut. Col. H. C. Newcomer, Corps of

Engineers, on preliminary examination, with plan and estimate of cost of improvement of Allegheny River, Pa., with a view to the construction of additional locks and dams, called for by the river and harbor act approved February 27, 1911.

Allegheny River has been improved by the United States under two projects, one an open-channel project involving the removal of bowlders, snags, and similar obstructions and the use of regularization dams and dikes; the other a slack-water project involving the construction of locks and dams. The three locks and dams completed under the latter project, after some dredging is done, will afford a navigable depth of 7 feet up to Natrona, 24 miles above the mouth of the river.

The district officer presents a plan for extending slack-water navigation nearly 36 miles farther, to a point about 5 miles above Mahoning, by the construction of five additional locks and dams, at points designated in his report, at a total estimated cost of $2,788,000. The cost of maintenance and operation will depend upon the amount of commerce and is estimated to vary from a minimum of about $25,000 a year to as much as $60,000 a year for a traffic of 4,000,000 or 5,000,000 tons. In the opinion of the district officer, who is also the division engineer, it is advisable for the United States to undertake this further improvement, work to be prosecuted at such a rate as to complete all the locks and dams in five years, the initial cash appropriation to be $300,000 with a contract authorization of $800,000.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated January 29, 1912, concurring in the recommendation of the district officer.

After due consideration of the above-mentioned reports, I concur in general with the views of the district officer, who is also division engineer, and the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of Allegheny River, Pa., by the construction of five additional locks and dams at the localities recommended by the district officer, and following in general the methods described in his report, is deemed advisable at an estimated cost of $2,788,000 for first construction and $25,000 to $60,000 annually for maintenance, these estimates being based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under an initial appropriation of $300,000, with a contract authorization of $800,000 and subsequent appropriations in amounts sufficient to complete the entire improvement within five years.

Very respectfully,

W. H. Bixby,
Chief of Engineers, United States Army.

The Secretary of War.

The purpose for which the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied is the completion of Locks and Dams Nos. 4 and 5, assuming that the total amount to be made available in connection with the present appropriation will be $600,000. It should be noted, however, that there has been no offer or promise of cooperation on the part of local interests, so that there may be no amount whatever available under the terms of the appropriation.

(For report of Board of Engineers, of Nov. 23, 1910, on obstruction by bridges at Pittsburgh, see p. 560.)

July 1, 1912, balance available	$28,650
Amount appropriated by river and harbor act approved July 25, 1912	[1] 300,000
Amount available for fiscal year ending June 30, 1913	328,650
July 1, 1912, amount covered by uncompleted contracts	825
Amount (estimated) required to be appropriated for completion of existing project	[2] [3] 2,188,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] [2] 600,000

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[1] Contingent upon local interests contributing the same amount.
[2] Exclusive of amount available for fiscal year 1913.
[3] Assuming that local interests will contribute $300,000.

MONONGAHELA RIVER, PA., LOCKS AND DAMS NOS. 4 AND 6.

Following is the latter of the Chief of Engineers, submitting report and recent examination, printed in House Document 1217, Sixty-second Congress, third session:

War Department,
Office of the Chief of Engineers,
Washington, December 31, 1912.

From: The Chief of Engineers.
To: The Secretary of War.
Subject: Preliminary examination with plan and estimate of cost of improvement of Monongahela River, Pa.

1. There are submitted herewith, for transmission to Congress, reports dated December 4 and 16, 1912, by Lieut Col. Francis R. Shunk, Corps of Engineers, on preliminary examination with plan and estimate of cost of improvement, respectively, of Monongahela River, Pa., with a view to the reconstruction of Locks and Dams Nos. 4 and 6, called for by the river and harbor act of July 25, 1912.

2. The Monongahela River has been improved by a system of 15 locks and dams. Traffic on the lower river is much heavier than on the upper river, and for this reason different dimensions of locks are required on the upper and lower reaches. Locks 1, 2, 3, and 5 have two chambers, each chamber being 56 feet by 360 feet. The present Lock 4 has two chambers, 50 feet by 158 feet and 56 feet by 227 feet, respectively. The smaller outer lock was completed in 1844 and the larger inside lock was completed in 1886. On account of the heavy traffic on this portion of the river it has been recognized for several years that the reconstruction of this lock so as to provide a chamber of standard dimensions was necessary, and its reconstruction has been recommended in the annual reports of the Chief of Engineers each year for several years. As there was apparently no reason for the reconstruction of the lock except its inadequacy as to size, it was not considered that its reconstruction could be authorized by the Secretary of War under the provisions of section 6 of the river and harbor act approved March 3, 1909, until a careful examination of the lock made in May, 1912, revealed that it had reached a condition where it was extremely dangerous to operate on account of failing walls and other defects which were such as to place the lock in danger of complete collapse at any time. In view of this latter condition and upon the recommendation of the Chief of Engineers, the Secretary of War on July 1, 1912, authorized the reconstruction under the provisions of section 6 of the river and harbor act of March 3, 1909, and made an allotment of $290,000 for the commencement of the work. Under this authority the lock will be reconstructed of standard dimensions and the object sought to be attained by the item under which this report is authorized is thus accomplished for this lock.

3. Lock No. 6 in its present condition has a single chamber 50 feet by 165 feet The district officer submits two plans for its reconstruction. The first plan contemplates the building of a new chamber of standard dimensions on the outside of the existing chamber and necessary repairs to the dam. The total estimated cost of this plan is $356,400. The second plan contemplates the same work as the first, and in addition the demolition of the old lock and its reconstruction to standard dimensions at a total estimated cost of $557,430, the operating expenses in either case being estimated at $12,000 per annum. The district officer is of opinion that two chambers of standard size are needed to accommodate the commerce which will probably use this lock, but suggests that possibly the facilities that would be afforded by the first plan might be found sufficient for some time to come. For reasons fully given the division engineer recommends the adoption of the first plan.

4. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated December 23, 1912. The board states that the commerce of Lock 6 in 1911 was reported at 207,543 tons, and while this will no doubt be exceeded with the opening of new coal mines along and above Pool 6, it appears that the prospect of congestion at this lock is not great and that one chamber of standard dimensions, in addition to the old chamber, will reasonably well meet the present and prospective requirements of commerce. For this reason the board concurs with the division engineer in recommending the reconstruction of Lock 6, under plan 1, at an estimated cost of $356,400.

5. After due consideration of the above-mentioned reports, I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore in carrying out the instructions of Congress I report as follows: That the improvement by the United States of Monongahela River, Pa.,

with a view to the reconstruction of Locks and Dams Nos. 4 and 6 is deemed advisable. The reconstruction of Lock 4 being already provided for under existing law, it is now recommended that an appropriation of $356,400 be made in one sum at an early date for reconstruction of Lock 6, under plan 1, following in general the methods described in the report of the district officer.

W. H. Bixby,
Chief of Engineers, U. S. Army.

WILMINGTON HARBOR, DEL.

The harbor of Wilmington, Del., is in the Christiana River and includes a length of about 4 miles above its mouth at the Delaware River. It also includes the navigable portion of the Brandywine River (2 miles), which flows into the Christiana River at a point about 1¾ miles above its mouth.

Previous to 1836, when the first appropriation for the improvement of the Christiana River was made, the low-water depth at the entrance to this stream was about 8½ feet. The minimum depth in the channel in the portion of the river below Third Street Bridge, Wilmington, was 8 feet. This depth was increased in 1836 by dredging to 10 feet below low water, and under projects of 1871 and 1881 to 12 and 15 feet, respectively.

The present project is based upon a survey made in 1895 and adopted in river and harbor act of June 3, 1896, report on which is printed in the Annual Report of the Chief of Engineers for 1896, page 973, and in House Document No. 66, Fifty-fourth Congress, first session. It provides for the formation, by dredging, rock removal, and construction of dikes, of a channel in the Christiana River 21 feet deep at mean low water from that depth in the Delaware River to the pulp works, a distance of about 4 miles, and thence diminishing to a depth of 10 feet at mean low water to the draw pier of the Philadelphia, Baltimore & Washington Railroad cut-off bridge No. 4, the width at the bottom varying between 250 feet at the mouth and 200 feet at bridge No. 4. The project further provides for the removal of shoals from bridge No. 4 to Newport to a depth of 7 feet at mean low water. This project was completed in 1906. The depth made over the rock ledges just above and below the Third Street Bridge is about 21½ feet.

Further work contemplated is for maintenance of the improvement.

The amount expended on this improvement from 1836 to June 30, 1912, is $1,107,985.46, which includes $500.69 expended from appropriation for emergencies in removal of obstructions from the channel above Churchman's bridge. Of this amount $705,363.56 was expended on the present project, and of which amount $261,711.93 was for maintenance.

At the close of the fiscal year the condition of the channel was as follows:

From the Delaware River to the outer end of the jetty, 16 feet deep at mean low water for a width of 250 feet; thence 18 feet deep for a width of 150 feet to the Third Street Bridge; thence 18 feet deep for a width of 100 feet to Pusey & Jones's marine railway; thence 14 feet deep for a width of 150 feet to the upper end of Pusey & Jones's shipyard; thence 18 feet deep for a width of 150 feet to the Baltimore & Ohio Railroad bridge; thence 13 feet for a width of 200 feet to the upper end of the pulp-works wharf; thence 11 feet for a width of 200 feet to cut-off bridge No. 4, and thence 100 feet wide and 7 feet deep to Newport. The maximum draft that could be carried on June 30, 1912, over the shoalest part of the river under improvement was 14 feet to the pulp works and 7 feet thence to Newport.

The range of tide is slightly over 6 feet at the mouth and about 3.6 feet at Christiana village. The stream is navigable to about a quarter of a mile above the village of Christiana, or 15½ miles above the mouth.

The river and harbor act of March 3, 1909, called for an examination of the Christiana River from Newport to Christiana, and a report thereon is printed in House Document No. 399, Sixty-first Congress, second session.

The tonnage of the leading articles shipped to and from Wilmington during the calendar year 1911 is reported to have been 859,736 short tons, valued at $68,674,051.

The shipbuilding industry on the river is quite extensive, the records of the Department of Commerce and Labor showing that, with the exception of Philadelphia and Newport News, Wilmington had the largest steel shipbuilding output on the Atlantic coast for the 10 years ending June 30, 1905.

The harbor improvements do not directly affect freight rates on light-draft boats to any large extent. Shipments thereon made by water range about 25 per cent lower in rate than by rail, but much more in deep-draft vessels, of which there are many, covering shipments to and from the manufacturers and shipbuilding plants.

A contract has been made for dredging with the appropriation made by the river and harbor act of February 27, 1911, and the contractor is now engaged in building banks to retain the dredged material.

The river and harbor act of February 27, 1911, made an appropriation of $100,000, and provided that a reexamination of the harbor be made with a view to determining a method by which an improvement adequate for the needs of commerce can be maintained at less cost. A board of officers has reported upon the matter, and its report thereon has been submitted to Congress and printed in House Document No. 359, Sixty-second Congress, second session.

The plan recommended was the purchase of a self-contained hydraulic dredge with auxiliaries, including a wharf, at an estimated cost of $250,000, with $30,000 annually for its operation. This plan was adopted by the river and harbor act approved July 25, 1912, which made an appropriation of $250,000 for purchase or construction of the dredging plant; and also provided that if, in the opinion of the Secretary of War, dredges of suitable character to do the work proposed are readily available for doing the work by contract at reasonable rates, the amount appropriated shall become immediately available for the prosecution of such work. An estimate of $30,000 for the fiscal year 1914 is therefore submitted for prosecution of the work.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$30,000

APPOQUINIMINK, MURDERKILL, AND MISPILLION RIVERS, DEL.

(*a*) *Appoquinimink River.*—At the time of the adoption of the present project there was a mean low-water depth of 2 feet at the entrance into Delaware Bay, and the shoalest depth inside the river was 4½ feet. The most serious obstructions to the navigation of the river were the many bends in the lower and middle sections.

The approved project is based upon a survey made in 1889, report on which is printed in the Annual Report of the Chief of Engineers for 1890, page 943, and in House Executive Document No. 19, Fifty-first Congress, first session. This project was adopted by Congress in river and harbor act of September 19, 1890, and provides for a channel 8 feet deep at mean low water, having a width of 80 feet from the bridge at Odessa, the head of navigation, to New Bridge, near Townsend's wharf, a distance of 3½ miles, and a width of 100 feet from this wharf to the mouth of the river, a distance of 5 miles. The estimated cost of the improvement is $39,963.

The amount expended on this improvement to June 30, 1912, is $53,909.67, of which $18,914.41 was for maintenance.

About four-fifths of the work on the project has been completed.

The maximum draft that could be carried on June 30, 1912, at mean law water over the shoalest part of the river under improvement is 6 feet in the river, and across the flats at the mouth 4 feet. The stream is navigable for small boats drawing 2 or 3 feet to Noxentown milldam, about 4 miles above Odessa. The mean range of tide is 6 feet at the mouth and 3½ feet at Odessa.

The commerce of the river for the calendar year 1911 is reported to have been 31,225 tons, valued at $1,911,450.

The freight rates, it has been reported, remain about the same, but the passenger business has increased in consequence of the improvement of the river.

The river and harbor act of February 27, 1911, provided for a preliminary examination and survey of the river. These have been made, and report thereon will be transmitted to Congress during the present session. The survey was made in the fall of 1911.

It is proposed to expend the funds recommended below in dredging for continuing improvement and for maintenance of the improvement to keep it available for navigation.

(*b*) *Murderkill River.*—This river is a tidal stream and a tributary of Delaware Bay and flows through Kent, County, Del. Its navigable portion is about 9 miles long. The condition of the river was fair for the greater part of its length, the average width and depth being 90 and 6 feet, respectively. Outside the junction with Delaware Bay, however, there was a serious obstruction—the flats, which are nearly bare at low tide and extend for nearly a mile from the shore.

The project for improvement, which was adopted in the river and harbor act of July 13, 1892, is for a 7-foot low-water channel, 80 feet wide from the town of Frederica, at the head of navigation, to the mouth of the river, and 150 feet wide from the mouth across the flats outside, to the 7-foot curve of depth in Delaware Bay, the cut at the mouth to be protected by forming an embankment of the dredged material on each side, the estimated cost being $47,550.

The amount expended on this improvement to June 30, 1912, is $76,840.94, of which $39,210.87 was for maintenance.

About 65 per cent of the project has been completed.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the river under improvement to Delaware Bay is 7 feet. The average rise and fall of the tide is 4.6 feet at the mouth and 2.5 feet at Frederica.

It has been impracticable to secure commercial statistics for the calendar year 1911, but the commerce reported for 1910, which was quite varied, was 35,173 short tons, valued at $1,437,200.

As to the effect of the improvement of this stream upon freight rates it is reported that rates by water are 25 to 50 per cent lower than by rail and that in winter, when the boats can not run, the railroad increases its rates.

The river and harbor act of February 27, 1911, provided for a preliminary examination and survey of this river and reports on them have been submitted. The survey was made in the fall of 1911.

It is proposed to expend the funds asked for below in dredging under the project and for maintenance to keep the channel available for navigation.

(c) *Mispillion River.*—This river is a tidal stream which enters Delaware Bay about 17 miles northwest of Cape Henlopen. It is navigable for about 12 miles. The mouth of the river was greatly obstructed by a flat foreshore without a channel. Vessels could enter and depart only at high water, the tidal range being about 4 feet.

The present project was adopted in the river and harbor act of March 2, 1907, and is based upon the report printed in House Document No. 102, Fifty-sixth Congress, second session. This provides for dredging the channel 6 feet deep at mean low water and 60 feet wide, increasing to 75 feet at sharp turns, from Milford to the mouth, and thence 4 feet deep and 150 feet wide across the flats, and the construction of a jetty along the south side of the channel, at an estimated cost of $87,065.

The amount expended on this improvement to June 30, 1912, is $169,152.04; of this amount $90,761.97 was on the present project. Of the latter amount $25,353.63 was for maintenance and $65,408.34 for continuing the project.

About 75 per cent of the project has been completed.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the stream under improvement was 6 feet in the river and 4 feet across the flats at the mouth. The range of the tide is 4½ feet at the mouth and 3½ feet at Milford.

It has been impracticable to obtain commercial statistics for the calendar year 1911. The commerce for 1910 was reported at 191,745 short tons, valued at $5,133,500.

The effect of the improvement on freight rates is stated to be quite marked, a reduction of an average of 25 per cent being reported. In addition, better and increased transportation facilities are afforded.

The river and harbor act of February 27, 1911, provided for an examination and survey of the river, and report thereon is printed in House Document No. 678, Sixty-second Congress, second session.

Under the present project the depth to be made across the flats at the mouth is only 4 feet, whereas that in the river is 6 feet. It is recommended that the depth be made 6 feet to the Delaware Bay.

It is proposed to expend the amount asked for below in drédging in accordance with the adopted project and for the maintenance of the improvement to keep it available for navigation.

Amount (estimated) required to be appropriated for completion of existing project	$12,000

Consolidated.

Amount (estimated) required to be appropriated for completion of existing project	24,264
Amount that can be profitably expended in fiscal year ending June 30,1914, for works of improvement and for maintenance	27,000

MISPILLION RIVER, DEL.

The following letter of the Chief of Engineers, submitting a report on a recent survey, is printed in House Document No. 678, Sixty-second Congress, second session.

War Department,
Office of the Chief of Engineers,
Washington, March 30, 1912.

Sir: I have the honor to submit herewith, for transmission to Congress, reports dated June 2 and November 28, 1911, with map, by Maj. R. R. Raymond, Corps of Engineers, on preliminary examination, with plan and estimate of cost of improvement, respectively, of Mispillion River, Del., authorized by the river and harbor act approved February 27, 1911.

This river is now being improved by the United States under a project which provides for dredging a channel 6 feet deep at mean low water and 60 feet wide on bottom, increasing to 75 feet at sharp turns, from the head of navigation at Milford to the mouth, a distance of about 13 miles; thence 4 feet deep and 150 feet wide across the flats, and the protection of the channel across the flats by a jetty. The improvement now desired is the making of a number of cut-offs to eliminate some sharp bends and shorten the distance between Milford and Delaware Bay, and an increase in the depth across the flats to 6 feet to correspond with the project depth in the river.

The district officer presents a plan for further improvement as follows: (*a*) Excavate five cut-offs in the river 6 feet deep and 50 feet wide on bottom, thereby shortening the distance up to Milford about 2½ miles and eliminating several long tortuous bends and sharp turns and rendering future maintenance more economical, as explained in his report; (*b*) restore the present river channel to project dimensions, 6-foot depth and 60-foot width where necessary; (*c*) dredge across the flats to a depth of 6 feet over a width of 80 feet instead of 150 feet; and (*d*) extend the existing south jetty 750 feet. This plan is estimated to cost $70,400, and $5,000 annually for maintenance, and is recommended by the district officer and by the division engineer.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, to whose report, dated December 19, 1911, attention is invited. The Board concurs with the district officer and the division engineer in recommending the improvement of this locality as proposed, subject, however, to the condition that no cut-off shall be undertaken until the necessary right of way therefor shall have been provided without cost to the United States.

After due consideration of the above-mentioned reports, I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore in carrying out the instructions of Congress I report as follows: That the improvement by the United States of Mispillion River, Del., is deemed advisable so far as to secure an available mean low-water depth of 6 feet throughout from Delaware Bay to the town of Milford and width of 60 feet in the river except through the five cut-offs, which are to be dredged only 50 feet wide, and with a width of 80 feet across the flats instead of 150 feet as at present projected; also the extension of the existing south jetty 750 feet, at an estimated cost of $70,400 for first construction and $5,000 annually for maintenance, subject, however, to the condition that no cut-offs shall be undertaken until the necessary right of way therefor shall have been provided free of cost to the United States. These estimates are based on the supposition that the work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of the full estimated cost of the improvement, viz, $70,400.

Very respectfully,

W. H. Bixby,
Chief of Engineers, U. S. Army.

The Secretary of War.

Milford is a town of about 3,000 population, is the seat of several large canning establishments and fertilizer works, and contains two busy shipyards. It is the center of a large and thriving agricultural region, whose products of fruits, berries, farm produce, grain and cattle it receives for shipment, and whose inhabitants it supplies with the necessities from its stores. The Delaware, Maryland & Virginia branch of the Pennsylvania Railroad passes through the town and shares with the river the transportation of the town and vicinity. There is no interchange of business between the two and no transfer facilities, as none are needed. The steamboat business originating at Milford terminates at Philadelphia and that arriving at Milford terminates there.

The commerce of the river reported for 1890 was 44,315 tons, valued at $916,250; for 1900, 104,395 tons, valued at $1,736,138; and for 1909, 187,356 tons, valued at $4,085,500. The statistics for 1910 have not yet been compiled. In 1900, 1 steamer and 11 schooners were trading in the river; in 1909,. 3 steamers and 6 schooners were reported. The regular steamboat trade began in 1900. Prior to that time the small schooner monopolized the trade, and there were 25 to 30 of them trading in the river.

MURDERKILL RIVER, DEL.

Following are extracts from report on a recent survey printed in House Document No. 1058, Sixty-second Congress, third session:

War Department,
Office of the Chief of Engineers,
Washington, October 31, 1912.

From: The Chief of Engineers.
To: The Secretary of War.
Subject: Preliminary examination and survey of Murderkill River, Del.

1. There are submitted herewith, for transmission to Congress, reports dated July 25, 1911, and March 16, 1912, with maps, on preliminary examination and survey, respectively, of Murderkill River, Del., authorized by the river and harbor act approved February 27, 1911; also a supplemental report on survey dated April 20, 1912.

2. This river is now being improved by the United States under a project which provides for a 7-foot low-water channel 80 feet wide from the town of Frederica at the head of navigation to the mouth of the river, and 150 feet wide from the mouth across the flats to the 7-foot contour in the Delaware River, the cut at the mouth being protected by an embankment formed of the dredged material placed on each side. This project, which has never been completed fo full width, is not now desired.

3. Local interests now desire a channel 8 feet deep at mean low water from Frederica to Delaware Bay, 60 feet wide to the mouth and 75 feet wide across the flats, with a jetty on the south side of the entrance; also 3 cut-offs to eliminate sharp bends, thus shortening the distance about 1½ miles, and an enlargement of the turning basin at Frederica. This improvement is estimated by the district officer to cost $94,000 and $4,000 annually for maintenance, or if the cut-offs are omitted, $81,100 and $6,000 annually for maintenance.

4. In the opinion of the district officer the cost of maintenance of the channel at the mouth will not be sufficiently reduced by the construction of a jetty at the present time to warrant the expenditure necessary therefor, and he recommends the desired improvement with this omission, and including the 3 cut-offs, upon condition, however, that the necessary land therefor will be deeded to the United States free of cost, the remainder of the work not to be contingent thereon. This plan, omitting the jetty, is estimated to cost $41,200 and $4,000 annually for maintenance. In the opinion of the division engineer, the entire work should be contingent upon the deeding free of cost to the United States of all lands necessary for cut-offs and right of way.

5. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith dated June 10, 1912. Having in mind the project depth on other streams in this vicinity, the board

was not convinced of the necessity of a depth of 8 feet, and therefore obtained from the district officer an estimate for a channel 7 feet deep as follows, viz: Following present course of river, $18,700 and $5,000 annually for maintenance: by the 3 cut-offs as recommended, $31,468 and $3,500 annually for maintenance. While the cost of the 3 cut-offs proposed is estimated to cost about $12,000 more than the cost of dredging the bends, it appears that this amount will soon be covered by the saving in maintenance gained thereby, and the board believes that the cut-offs are desirable and in the interests of better navigation. After careful consideration of this subject, the board recommends the modification of the existing project so as to provide for a channel 7 feet deep at mean low water from Frederica to Delaware Bay and 60 feet wide to the mouth and 75 feet wide thence across the flats, the enlargement of the turning basin at Frederica and 3 cut-offs each of which shall be contingent upon the donation of the necessary land therefor, at an estimated cost of $31,468 and $3,500 annually for maintenance.

6. After due consideration of the above-mentioned reports I concur in general with the views of the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of Murderkill River, Del., is deemed advisable so far as to secure an available channel depth of 7 feet at mean low water and width of 60 feet from Frederica to the mouth of the river, including 3 cut-offs, thence 75 feet wide across the flats, and the enlargement of the turning basin at Frederica, following in general the methods described in the report of the district officer at an estimated cost of $31,468 for first construction and $3,500 annually for maintenance, each of the cut-offs to be made contingent upon the donation of the necessary land therefor. These estimates are based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of the entire estimated cost of improvement.

Edw. Burr,
Colonel, Corps of Engineers,
Acting Chief of Engineers.

Murderkill River is a tributary of Delaware Bay, flowing through Kent County, Del., from its source, near the Maryland line, and emptying into the bay about 25 miles above Cape Henlopen. Its tidal portion, which is now about 13 miles in length, is very crooked, flowing for the most part through low-lying marshes or meadows, with the highland touching the river's margin only at long intervals.

Frederica is 7 miles from the railroad by a heavy, sandy road, over which hauling is very difficult. The river, therefore, is the only outlet and avenue of commerce it has. There is a steamboat plying regularly between Frederica and Philadelphia which makes two round trips a week throughout most of the year and three during the fruit and grain harvest. It carries hundreds of passengers also to and from Bowers Beach, at the mouth of the river, which has grown from a little village of fishermen's shanties to a large and flourishing summer resort. Many power boats and yachts visit Bowers during the summer and add their demands for an adequate channel. It is also a station of the Delaware oyster police and a patrol boat is kept there all the time.

In 1882, when the first examination of the stream was made, the commerce of the Murderkill River was estimated at a value of $268,650. In 1909 the total was reported as 26,067 tons, valued at $1,324,700. Some years have made a better showing than this and some not as good, according to the crops.

During all these years of progressive improvement the steamboat has been compelled to follow a schedule dependent upon the tide, and consequently irregular. The improvement within the river has now reached a stage at which the steamboat can move between Frederica and the mouth at any time regardless of the tide, except that at a number of sharp points difficulty is encountered when the tide is down and the width of waterway correspondingly narrowed. But at the mouth the duration of the dredged channel is so uncertain that a tidal schedule must be followed, and this consequently controls the movement throughout the whole stream. The mouth is therefore the principal objective point for further permanent improvements.

Frederica and the surrounding thickly settled country, practically isolated from the railroad, are dependent upon the river in marketing their productions and getting their supplies. It is therefore imperative that the improvement of the river should keep abreast, if not a little in advance, of the needs and demands of the growing communities.

There are no public wharves along the river. The Frederica & Philadelphia Navigation Co. has three wharves on the river, which are available to the public without charge when the company is not using them. No direct connection is made from these wharves with railroad or other transportation lines.

All the available water power has been appropriated and used by private enterprise. There are no freshets in the river, owing to its flat watershed.

BROAD CREEK RIVER, DEL.

This is a tributary of the Nanticoke River, and in 1881 the controlling depth was 1½ feet. It rises near the Great Cypress Swamps in the southern part of Sussex County, Del.; its length is about 18 miles; its general direction of flow is westerly, and it empties into the Nanticoke River about 6 miles below Seaford, Del. The length of the particular section included in the project is 4 miles, and its lower end is about 3 miles above the mouth of the river. In 1889 a channel 6 feet deep at mean low water and 50 feet wide had been dredged under project dated June 14, 1880, from Bethel to Laurel at a cost of $35,000. The project of July 13, 1892, was for a channel 70 feet wide and 8 feet deep at mean low water between Bethel and Laurel at an estimated cost of $15,000. This project was completed and maintained to June 30, 1912, at a cost of $22,462.57, of which $7,462.57 was for maintenance.

The existing project, adopted by the river and harbor act of July 25, 1912, is for an 8-foot mean low-water channel 70 feet wide between Portsville Landing and Laurel; to straighten and widen several sharp bends in the river; and to widen the channel below the railroad bridge so as to provide a suitable turning basin.

No modification has been made in the existing project. Work under contract for maintenance was in progress during the year and resulted in restoring the channel of the previous project to required dimensions, except for a short distance at the upper end, where it was reduced to 60 feet in width to secure the stability of some wharves.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel is 8 feet. The mean range of tide is 3 feet. The length of the improved portion of the river is 4 miles. Laurel, the head of navigation, is 7½ miles from the mouth of the river.

The commerce of the river for the year ending May 1, 1909, is reported to be 28,480, and for the year ending December 31, 1911, 31,201 short tons, consisting of berry crates, fertilizers, gum logs, lumber, and general merchandise, valued at $250,735.

The improvement is reported to have made a reduction in railroad rates, but not in water rates. Funds asked for will be expended for maintenance.

Amount available for fiscal year ending June 30, 1913	$14,557.43
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	2,000.00

BROADKILL RIVER, DEL.

In its original condition the depth of water in the river was from 3 to 4 feet at the numerous shoals, which impeded navigation. The depth at the mouth was from 1½ to 2 feet at low water.

Prior to the adoption of the existing project, $35,000 was expended in providing a channel within the river, 6 feet deep and 40 feet wide at low water, from the mouth to Milton, a distance of about 12½ miles.

An examination was made of the mouth of the river in 1894, report on which is printed in the Annual Report of the Chief of Engineers for 1895, page 1151, and in House Executive Document No. 70, Fifty-third Congress, third session.

The present project was adopted in the river and harbor act of March 2, 1907, and is based upon report and estimate submitted in House Document No. 214, Fifty-ninth Congress, second session. It provides for the establishment of a permanent entrance at the mouth of the river by dredging a channel from the 6-foot curve in Delaware Bay to the same depth in the river and constructing a jetty on the north side of this channel.

The river and harbor act of March 2, 1907, appropriated $33,330 for the work. The land needed for the cut to be made across Lewes Cape was deeded to the United States free of cost; the jetty across Lewes Cape and Lewes Sound from the 6½ to 7 foot depth in Delaware Bay to the high-water line in the marsh of Lewes Sound on its western side, a total length of 1,263 feet, was completed in November, 1908; and a channel 6 feet deep and 150 feet wide at bottom was dredged from the 6-foot depth in Delaware Bay to the same depth in Lewes Sound. This was done in 1908 and completed the project. In 1908-9, $7,282.67 was expended in the repair and restoration of the jetty, and with an allotment of $3,000 from the appropriation made by the river and harbor act of March 3, 1909, 729 tons of stone was placed in the jetty, filling the structure across the old creek to the top of the piling, and the remainder to the top of the waling.

The river and harbor act of June 25, 1910, appropriated $5,000 for maintenance of the improvement, but the proposals received for part of the repairs then needed were found excessive and were rejected. The river and harbor act of February 27, 1911, appropriated $10,000 for maintenance. With these combined appropriations dredging and jetty work were done. The channel was dredged from Milton to a point about 8 miles below to a depth of 6 feet and a width of 40 feet, resulting in a channel not less than 5 feet deep at mean low water from Milton to the mouth; and work has been in progress since the early part of May, 1912, in reenforcing and repairing the jetty at the mouth.

The amount expended on this improvement to June 30, 1912, was $86,666.18, of which $51,636.18 is on the present project. Of the latter amount $18,438.21 was for maintenance.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the improvement was 5 feet in the river and 4 feet at the mouth.

It has been impracticable to obtain complete commercial statistics. The commerce reported for the calendar year 1910 was 10,929 short tons, valued at $320,105.

The water rates are about two-thirds of those by rail. These rates are not expected to be lowered by the improvement of the stream, but better service will make them of more value to the community and largely increase the amount of freight.

It is proposed to expend the amount recommended below in dredging the channel from Delaware Bay to the head of navigation at Milton, and to repair the jetty at the mouth, both for the maintenance of the improvement and to keep the locality available for navigation.

In the opinion of the local officer certain additional works are desirable in connection with this improvement and a reexamination of the project is therefore recommended.

July 1, 1912, amount covered by uncompleted contracts	$5,450
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	5,000

LEIPSIC RIVER, DEL.

This is a tidal stream which enters Delaware Bay about 10½ miles below Bombay Hook Light at the mouth of Smyrna River. At the time of the survey about 7 feet draft could be carried, with varying widths, across the bar at the mouth and to within 1 mile of Garrison's mill, the head of navigation, a distance of about 18 miles. The town of Leipsic is about 5½ miles below.

No money has heretofore been expended on this stream by the Federal Government.

The present project was adopted by the river and harbor act of June 25, 1910, and is based upon a survey made in 1909, report on which is printed in House Document No. 574, Sixty-first Congress, second session. It provides for making cut-offs—numbered 2, 3, and 4 on plan submitted with the report—located between the necks of land formed by the course of the Leipsic River between the mouth and the town of Leipsic, the width and depth to be 50 feet at bottom and 6 feet at mean low water, respectively, at an estimated cost of $18,500, the remainder of the project proposed in the report to await the result of this work.

This work was completed in September, 1911. A channel 50 feet wide at bottom, with 1-on-1 slopes and 7 feet deep at mean low water, was made through each of the cut-offs. The depth included 1 foot overdepth made and allowed under the contract. The cut-offs shorten the river about 2 miles.

The amount expended on this improvement to June 30, 1912, was $9,557.99, no part of which was for maintenance.

The existing project was modified by the river and harbor act approved July 25, 1912, so as to provide for making cut-offs numbered 1 and 5, in accordance with plan printed in the document above referred to, subject to the condition that the land required for making said cut-offs, or easements therein, shall be furnished free of cost to the United States, and that the United States shall be released from all claims for damages arising from the proposed diversion of the stream.

The act of 1912 also adopted a further project for improvement of this stream, in accordance with plan printed in House Document No. 647, Sixty-second Congress, second session, which contemplates securing an available channel depth of 5 feet and a bottom width of 40 feet from Leipsic to Garrison's mill, including one cut-off and a turning basin at Garrison's mill, at an estimated cost of $19,600 for first construction, with $1,500 for maintenance, provided local interests furnish the necessary right of way free of cost to the United States, and that all obstructions at Martins Bridge are removed prior to the work being undertaken by the United States. The act makes an appropriation of the full amount required for doing this work.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the river was about 6 feet and over at the bar at the mouth 6½ feet. The range of tide is 5.3 feet at the mouth, 3 feet at Leipsic, and 2.4 feet at Garrison's mill.

The commerce of the river for the calendar year 1911 is reported to have been 15,498 tons, valued at $327,208. It consisted largely of agricultural products and canned goods.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

LITTLE RIVER, DEL

This is a new project, for which provision is made in the river and harbor act of July 25, 1912, in accordance with the plan printed in House Document No 626, Sixty-second Congress, second session, upon the condition specified in said report.

This is a tidal stream about 8 miles long emptying into Delaware Bay about 70 miles below Philadelphia. The town of Little Creek, 3½ miles above the mouth, is practically the head of navigation. The range of tide is about 5 feet at the mouth and 4.3 feet at the drawbridge at the town. The controlling depth over the flats at the mouth is about 3 feet at mean low water and within the river it is about 4 feet, with occasional depth of as much as 12 feet.

The project for this improvement is based upon a survey made in 1911, and provides for securing an available channel depth of 5 feet from the town of Little Creek and a width of 40 feet, increased to 60 feet across the flats at the mouth, at an estimated cost of $14,000 for first construction, with $1,000 annually for maintenance. The plan of improvement includes five cut-offs.

It is proposed to expend the funds recommended below in dredging for maintenance of the improvement.

Amount appropriated by river and harbor act approved July 25, 1912	$14,000
Amount available for fiscal year 1913	14,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	1,000

ST. JONES RIVER, DEL.

Before the channel was improved the least practicable low water depth of Lebanon, 12 miles above the mouth, was 4 feet, and thence to Dover, 9 miles farther up the river, only 2½ feet.

The present project, which was adopted in the river and harbor act of June 25, 1910, is based upon a survey made in 1908, report upon which is printed in House Document No. 1116, Sixtieth Congress, second session, and provides for a depth of 7 feet at mean low water, with widths varying in different reaches between Dover and Delaware Bay, including 16 cut-offs and a pile, brush, and stone jetty on the north side at the mouth, at an estimated cost of $181,425 and $1,700 annually for maintenance after completion.

The river and harbor act of June 25, 1910, provides that no part of the appropriation therein made shall be expended until satisfactory title to the land required for the necessary cut-offs shall have been furnished to the United States free of cost; and the river and harbor act of February 27, 1911, appropriated $11,700 for continuing improvements and for maintenance, with the proviso that no part thereof be expended, except for maintenance, until the title referred to shall have been furnished. Dredging being urgently needed for maintenance of the channel, a subproject has been approved by the Chief of Engineers, under which the channel is to be redredged from Lebanon to Delaware Bay to a depth of 6 feet at mean low water, the width to be 40 feet in the river and 50 feet across the flats at the mouth. The work is to be begun soon.

The amount expended on the improvement to June 30, 1912, is $70,533.37, of which $23,224.10 was for maintenance. All these funds were expended on projects previous to that adopted in the river and harbor act of June 25, 1910.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the improvement between Lebanon and the Delaware River was 4 feet. The range of tide is 4½ feet at the mouth, 2 feet at Lebanon, and 1.6 feet at Dover, the head of navigation, 17 miles above the mouth.

The commerce of the river for the calendar year 1911 is reported to have been 100,154 tons, valued at $5,876,550. It consists of agricultural products, canned goods, general merchandise, etc.

It is stated that the improvements made have reduced freight rates by one-fourth to one-half, besides increasing shipments, especially fruits, which now reach the market in less time and in fresher condition.

The title papers for the land required for a number of the proposed cut-offs have been submitted, and it is stated that the remainder will be furnished soon.

It is proposed to expend the amount asked for below in dredging for maintenance of the improvement to keep it available for navigation.

Amount (estimated) required to be appropriated for completion of existing project	$144,725
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	5,000

INLAND WATERWAY BETWEEN REHOBOTH BAY AND DELAWARE BAY, DEL.

This is a new project for which provision is made in the river and harbor act of July 25, 1912, in accordance with the reports submitted in House Document No. 823, Sixtieth Congress, first session, and in Rivers and Harbors Committee Document No. 51, Sixty-first Congress, third session, and subject to the conditions that the land needed for right of way, or easements therein, shall be furnished free of cost to the United States.

The improvement contemplated embraces the section between Rehoboth Bay and Delaware Bay of a former project for the inland waterway between Chincoteague Bay, Va., and Delaware Bay, Del., on slightly different lines, avoiding, as far as possible, the high lands on the route, and following Lewes Creek nearly to its mouth and thence by a short cut into Broadkill River just above its mouth. The plan provides for constructing a canal 6 feet deep at mean low water and 50 feet wide at bottom, narrowing to 40 feet where it passes through deep cutting, at an estimated cost of $356,000, including items for dredging, purchase of land for right of way, and two bridges. The estimate for the purchase of the land, which, by the act above quoted, is to be furnished to the United States free of cost, was $14,275.

The tidal range at the mouth of Lewes Creek on the bay shore is about 4 feet and at Lewes about 2 feet. There is no tidal variation in Rehoboth Bay, differences of level depending upon the winds.

From Rehoboth Bay to Lewes along the line of the proposed canal is about 7¼ miles, and from Lewes to the new mouth of the Broadkill 4¼ miles, making the total length 11½ miles.

It is proposed to apply the funds asked for below in dredging in continuation of the project.

Amount appropriated by river and harbor act approved July 25, 1912......	$50,000
Amount available for fiscal year 1913....................................	50,000
Amount (estimated) required to be appropriated for completion of existing project..	291,725
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement..	41,725

NANTICOKE RIVER, DEL. AND MD.

The Nanticoke River is a tidal stream, its headwaters consisting of numerous branches rising mainly in the northern section of Sussex County, Del. The river flows in a southwesterly direction into Tangier Sound, Chesapeake Bay, and the interests for the improvement of the river center at Seaford. It is about 50 miles in length, and flows in a generally southwesterly direction. The length of the particular section included in the project is about 2 miles and its lower end is 34 miles above the mouth of the river.

The existing project for the improvement of the Nanticoke River adopted by the river and harbor act of June 3, 1896, is based upon a survey made in 1895, and is for a channel 9 feet deep at mean low water and 100 feet wide, the width to be increased to about 150 feet at sharp turns of the channel, the improvements to be extended to within 100 feet of the country bridge, where the proposed channel is to widen out fan shaped, at an estimated cost of $13,000. This was modified by the river and harbor act of June 25, 1910, to allow a slight widening between the bridges at Seaford, at an additional cost of $2,860. Reports on examinations and surveys are to be found in House Document No. 323, Fifty-third Congress, third session, with map, and House Document No. 674, Sixty-first Congress, second session (no map) and in the Annual Report of the Chief of Engineers for 1895, pages 1165–1167. The existing project, with all modifications incorporated, is for a channel 9 feet deep at mean low water and 100 feet wide, the width to be increased to about 150 feet at sharp turns of the channel, to extend to within 100 feet of the county bridge, where the proposed channel is to widen out fan shaped. Work under contract for maintenance was in progress during the year, and resulted in restoring the channel to project dimensions.

The amount expended on the existing project to June 30, 1912, is $60,925.24, of which $17,109.93 was for maintenance. These figures include both the Nanticoke River proper and the Northwest Fork. To June 30, 1912, the project has been completed and maintained in good condition.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel was 9 feet. The mean range of tide is about 3.4 feet. The length of improved sections of the river is about 2 miles. Seaford, the head of navigation, is 36 miles from the mouth.

The commerce of the river is reported to be as follows: 1903, 119,038; 1904, 120,229; 1905, 121,769; 1906, 119,348; 1907, 121,733; 1909, 135,241; 1910, 136,569; and for the year ending December 31, 1911, 148,006 short tons, consisting of agricultural products, canned goods, cans, coal, corn, fertilizers, general merchandise, lumber, and oysters, valued at $8,383,730.

The improvement has made no appreciable difference in water rates; railroad rates have been reduced. Funds asked for will be expended for maintenance.

Northwest Fork of Nanticoke River (Marshyhope Creek) is about 30 miles in length. It rises in Kent County, Del., and flows past Federalsburg, Md. (the head of tidewater), in a general southerly direction, through Dorchester County, Md., to its junction with Nanticoke River opposite Riverton. From its mouth to upper Browns Wharf, the head of steamboat navigation, 5¼ miles below Federalsburg, the minimum depth of water was more than 6 feet. From this point, where the stream is 150 feet wide, to a point one-half mile below Federalsburg, it is about 100 feet wide. This reach contained numerous shoals of gravel, sand, and mud. The length of the section included in the project is 5¼ miles, and the distance of its lower end from the mouth of the river is 11¾ miles.

The existing project, which is the original one for this work, was adopted by the river and harbor act of June 25, 1910, and provides for a channel 60 feet wide at bottom and 6 feet deep at mean low water from upper Brown's wharf to within about one-half mile below the south boundary of the town of Federalsburg, with a turning basin at the upper end, at an estimated cost of $44,197.44, with $2,000 annually for maintenance after completion. Report on examination and survey is to be found in House Document No. 869, Sixtieth Congress, first session (no maps). No modification has been made in the existing project. Work under contract for completion was in progress during the year and resulted in completing the improvement.

The amount expended on this section of the river to June 30, 1912, is $44,197.44, of which $8,761.34 was for maintenance, and is included in the amount stated for Nanticoke River.

To June 30, 1912, the project had been completed and partially maintained. The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 5½ feet. The mean range of tide is 2.6 feet. The length of the improved section is about 5¼ miles. The head of navigation is within one-half mile of Federalsburg. The navigable portion of the stream is 16 miles in length. This project was not completed until near the close of the fiscal year; for this reason there was very little traffic on the river during the calendar year 1911. It was impracticable to determine the effect of improvement on freight rates. Funds asked for will be expended in maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$3,600

YORK SPIT CHANNEL, BALTIMORE HARBOR, MD.

Following is the report of the Board of Engineers on a recent survey, printed in House Document No. 1190, Sixty-second Congress, third session:

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
December 23, 1912.

To the CHIEF OF ENGINEERS, United States Army:

1. The existing project for improvement of the channel to Baltimore Harbor provides for a depth of 35 feet at mean low water and a bottom width of 600 feet from Fort McHenry to deep water in Chesapeake Bay and through the shoals opposite York Spit in the lower end of the bay. The adopted width of 600 feet has proven ample in the comparatively protected waters of the upper bay, but it has been found that, owing to the exposed location of the York Spit Channel, which is open to the sweep of the winds from the Atlantic Ocean, and the further complications of conflicting currents, pilots and shipowners hesitate to use this section on account of the contracted width and the danger of grounding and damaging their vessels. The district officer states that the Pilots' Association has declined to bring the larger vessels coming to Baltimore through this channel at night, and are averse to doing so in the daytime under unfavorable weather conditions. As a consequence, it appears that an average of three or four vessels of large displacement are each week thus detained overnight, occasioning considerable delay and hardship.

2. Navigation interests desire that the channel be widened to at least 1,000 feet and from his investigation the district officer expresses the opinion that the York Spit section of the channel leading to Baltimore is worthy of further improvement to the extent of increasing the width to 1,000 feet. Estimates for such widening are given as follows:

Allowing no overdepth	$206,250
Allowing for 1 foot overdepth	305,250
Allowing for 2 feet overdepth	412,500

It is believed that the yearly maintenance would not exceed $20,000. The division engineer concurs in the views of the district officer regarding the advisability of the proposed widening, and expresses the opinion that the work should allow for 1 foot overdepth, the estimate for which amounts to $305,250.

3. After consideration of the facts presented, the board has reached the conclusion that the widening of the York Spit section of the channel to Baltimore to the extent proposed by the district officer is essential to the safe and expeditious navigation of the larger vessels plying to Baltimore, and it therefore expresses the opinion that it is advisable for the United States to undertake the improvement under the plan allow-

ing for 1 foot overdepth, at a first cost of $305,250, and a subsequent expenditure for maintenance amounting to $20,000 per annum. The full amount of the estimate should be provided in one appropriation.

4. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

Wm. T. Rossell,
Colonel, Corps of Engineers,
Senior Member of the Board.

HARBORS AT ROCKHALL, QUEENSTOWN, CLAIBORNE, AND CAMBRIDGE, AND CHESTER, CHOPTANK, WARWICK, WICOMICO, POCOMOKE, LA TRAPPE, AND MANOKIN RIVERS, AND TYASKIN CREEK, MD.

(*a*) *Rockhall Harbor and inner harbor at Rockhall.*—In 1894 the controlling depth at Rockhall Harbor was 5 feet at mean low water. The general dimensions of the harbor are about one-third mile wide by three-fourths mile long. It is located on the eastern shore of Chesapeake Bay, about 25 miles southeast of Baltimore Harbor.

With an appropriation of $16,600, made June 3, 1896 (the first for this work), a project was carried out in 1897–98 for dredging a cut 80 feet wide and 10 feet deep at mean low water from the 10-foot curve in Swan Creek Inlet to the 10-foot depth in Chesapeake Bay, and a channel 100 feet wide and 10 feet deep from that depth in Swan Creek Inlet to the old pier at Rockhall. A turning basin, embracing the old and new piers, was also dredged.

In accordance with the river and harbor act of March 3, 1899, an examination was made of Rockhall Harbor and the inner harbor at Rockhall. The project then proposed was to dredge a channel 12 feet deep and 150 feet wide from Chesapeake Bay to Swan Creek Inlet, across Swan Point Bar, and 12 feet deep and 150 feet wide from Swan Creek Inlet to the wharf at Rockhall, at a cost estimated in 1899 to be $43,065, with $9,208 every two years for maintenance.

The river and harbor act of June 13, 1902, adopted this project, which is the existing one. The unit price of dredging exceeded that assumed in the original estimate, and the estimated cost of the project was therefore increased May 13, 1907, to $60,386.81, and further increased April 9, 1912, to $71,196.81, due to the broadening of the outer bar, which prevented completion of the project under the previous increase. Lack of wharf facilities and use of the inner harbor render it undesirable for the United States to continue work in that section of the improvement, and it is recommended that it be dropped. Recommendation is also made to modify the project for the section embracing the channel through the outer bar by reducing it from 12 feet to 10 feet, the reasons for which are the proximity of a deeper channel to the southward, the large cost of maintenance, and the comparatively small number of vessels which would have to use it.

Report on an examination and survey will be found in House Document No. 99, Fifty-sixth Congress, first session (no maps), and in the Annual Report of the Chief of Engineers for 1900, pages 1670–1672. No modifications in the existing project have been made.

Work under contracts for improvement and maintenance was in progress during the fiscal year, and resulted in extending the project from the 12-foot contour in Swan Creek Inlet westward for a distance of 4,360 feet and in restoring about 700 feet of the portion previously dredged. The amount expended on the present project to June 30, 1912, is $64,831.64, of which $4,484.91 was for maintenance. Work to June 30, 1912, has resulted in completing about six-sevenths of the approved project.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel across Swan Point Bar is 8 feet and in the inner harbor 12 feet. The average range of tide is about 1 foot. The length of all improved sections of the channel is about 2½ miles. The harbor is a bay making in from Chesapeake Bay, and is navigable in fact to Rockhall Pier, which is about one-fourth mile above the mouth of Rockhall Harbor.

The commerce for the fiscal year 1909 was 19,827 short tons, while for the year ending December 31, 1911, it is reported to be 8,570 short tons, consisting of canned goods, coal, fertilizers, fish, lumber, oysters, and wheat, valued at $194,350.

It is stated that the improvement has had no appreciable effect on freight rates. The funds asked for will be applied to completing the project.

(b) *Queenstown Harbor.*—Before 1871 the controlling depth in this harbor was 6 feet at mean low water. The general dimensions of the harbor are about one-half mile square. It is located on the eastern shore of Chesapeake Bay, on Chester River, about 35 miles southeast of Baltimore Harbor. Between 1871 and 1880 it was improved under a project dated January 2, 1871, and a channel 100 feet wide at bottom and 8 feet deep at mean low water was made. In 1897, with $5,000 appropriated for continuing the improvement, a channel was dredged to 8¼ feet at mean low water and 100 feet wide from Chester River to the inner harbor, and in 1900 a shoal extending from a point about 138 feet above the lower light down for a distance of 950 feet was dredged to a depth of 8 feet and a width of 80 feet, the total amount expended for this work being $19,000.

The existing project, adopted in the river and harbor act of June 13, 1902, provided for increasing the dimensions of the channel to 10 feet deep and 200 feet wide, at an estimated cost of $23,100. The unit price of dredging exceeded that in the original estimate, and the cost of the project was therefore increased May 13, 1907, to $25,886.35. Report on the examination and survey will be found in House Document No. 92, Fifty-sixth Congress, first session, with map, and in the Annual Report of the Chief of Engineers for 1900, pages 1673–1676.

No modification in the existing project has been made.

The amount expended on the present project to June 30, 1912, is $32,530.45, of which $6,672.18 was for maintenance. Work to June 30, 1912, has resulted in completing the project and its restoration to project dimensions. The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 9 feet. The mean range of tide is about 2 feet. The improved portion of the channel is about 1 mile long. The harbor is a bay making from the Chester River, and is navigable, in fact, to Queenstown, the head of navigation, which is about one-half mile above the mouth of the harbor. The commerce of the harbor is reported to be as follows: 1900, 12,373; 1901, 11,328; 1902, 18,769; 1903 (only partial statistics could be obtained), 3,889; 1904, 19,144; 1905, 19,421; 1906, 19,808; 1907, 20,202; 1908, 22,220; 1910, 22,439; and for the year ending December 31, 1911, 28,142 short tons, consisting of agricultural products, canned goods, coal, corn, fish and oysters, tomatoes, wheat, and general merchandise, valued at $1,389,460.

The improvement has made no perceptible difference in freight rates. The funds asked for will be expended in restoring the channel to project dimensions.

(c) *Claiborne Harbor, Md.*—Before 1902 the controlling depth in this harbor was 9 feet at mean low water. The general dimensions of the harbor are about one-half mile square. It is located on the eastern side of Eastern Bay, a tributary of the Chesapeake Bay, about 42 miles southeast of Baltimore Harbor and 6 miles east of Bloody Point Lighthouse. No improvement had ever been made there by the United States previous to the existing project.

The act of June 13, 1902, adopted the existing project, which provides for dredging a channel 12 feet deep at mean low water and 300 feet wide from the 12-foot contour in Eastern Bay to the railroad pier in the harbor, a distance of about 1,900 feet, and thence shoreward along the south side of the pier to a width of 195 feet for a length of 500 feet, at an estimated cost of $17,490, and a further sum of $2,500 for an extension of the existing jetty should it be found necessary.

Owing to the facts that the unit price of dredging has exceeded that in the original estimate and the small appropriations, the work has been prolonged and the total cost of the project was increased May 13, 1907, to $27,408.30. This sum, increased by the $2,500 estimated as required for jetty extension, makes the total amount estimated to complete the existing project $29,908.30.

The jetty extension was deemed necessary to preserve the north side of the channel to project dimensions from the current from Eastern Bay around Tilghmans Point, which, passing over the sand flats, carries material into the dredged channel at the outer end of the present jetty. The scour has been considerable in the last few years and has eroded Tilghmans Point, which formerly acted as a deflector, to such an extent as to render jetty extension necessary for the maintenance of the channel.

Report on the examination and survey upon which the project is based will be found in House Document No. 81, Fifty-sixth Congress, first session, with map, and in the Annual Report of the Chief of Engineers for 1900, pages 1677–1681. No modification in the existing project has been made.

Work under contracts for maintenance and jetty construction was in progress during the year, and resulted in restoring the channel to project dimensions, and completing the jetty.

The total amounts expended on the existing project to June 30, 1912, is $49,610.21, of which $19,736.56 was for maintenance. Work to June 30, 1912, has resulted in completing the project and the restoration of the channel to project dimensions.

The maximum draft that can be carried June 30, 1912, at mean low water over the shoalest part of the channel is 12 feet. The mean range of tide is about 2 feet. The length of all improved sections is about 2,400 feet.

Claiborne is at the head of navigation in Claiborne Harbor, and is the western terminus of the Baltimore, Chesapeake & Atlantic Railway. It is about one-half mile from the mouth of the harbor.

The commerce of the harbor is reported to be as follows: 1903, 89,549; 1904, 90,435; 1905, 93,603; 1906, 91,957; 1907, 93,794; 1908, 103,173; 1909, 104,201; 1910, 105,249; and for the year ending December 31, 1911, 105,511 short tons, consisting of agricultural products, canned goods, coal, general merchandise, and lumber, valued at $8,966,291.

The improvement has made no appreciable difference in freight rates. The funds asked for will be applied to maintaining the completed channel.

(*d*) *Cambridge Harbor*.—In 1870, before operations were commenced, there was a controlling depth of 4 feet. The general dimensions of the harbor are about three-fourths mile long by one-fourth mile wide. It is located on the eastern side of Choptank River about 20 miles above its mouth, and is distant southeastwardly from Baltimore Harbor about 65 miles.

The improvement of the harbor was commenced in 1871 with a project submitted in March of that year for an entrance way of 100 feet in width and to provide sufficient harbor accommodations of a depth of 10 feet at mean low water. The estimated cost was $36,000. The sum of $10,000 was appropriated March 3, 1871, and work begun. On this and succeeding projects $50,237 was expended to June 30, 1896, resulting in a channel 150 feet wide and 12 feet deep at mean low water from that depth in the Choptank River to the railroad wharf, a distance of nearly a mile. The inner harbor below the bridge had been dredged over its whole irregular area to a depth of 10 feet, and the part of the harbor above the bridge for a distance of 750 feet had been dredged to a depth of 8 feet and a width of 215 feet.

The existing project was adopted June 13, 1902, and is for a 12-foot low-water channel 150 feet wide from the 12-foot curve in the Choptank River to a point 500 feet outside the Baltimore, Chesapeake & Atlantic Railway Co.'s steamboat wharf, and from this point gradually widening to the harbor line at the wharf; from the steamboat wharf to Mill Wharf to increase the width an average of 200 feet, with a depth of 8 feet, making an anchorage basin; increasing the width of the lower harbor 40 feet on the north side and widening the upper harbor an average of 360 feet along the channel already dredged to a depth of 8 feet. The estimated cost of the project was $8,120. The estimate of cost of the project was increased May 13, 1907, to $13,858.25. Report on the examination and survey upon which the existing project is based will be found in House Document No. 119, Fifty-fourth Congress, second session (no maps); in House Document No. 560, Sixty-first Congress, second session, with map; and in the Annual Report of the Chief of Engineers for 1897, pages 1296–1297. No modification in the existing project has been made. Work under contract for maintenance was in progress during the year, and resulted in restoring the channel to project dimensions.

The amount expended on the existing project to June 30, 1912, is $16,454.22, of which $5,370.09 was for maintenance. To June 30, 1912, the project has been completed and the channel restored to project dimensions.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel below the bridge was 12 feet and 8 feet above. The mean range of tide is about 1.7 feet. The length of the improved sections of this harbor is about 1 mile. Cambridge is the head of navigation, to which point the harbor is navigable in fact.

The commerce is reported to be as follows: For the year ended December 31, 1909, 115,195; 1910, 116,343; and in 1911, 122,176 short tons, consisting of agricultural products, canned goods, coal, fish and oysters, and general merchandise, valued at $10,955,859.

The improvement has made no appreciable difference in freight rates.

(*e*) *Chester River, Md., from Crumpton to Jones Landing.*—Before operations were undertaken on this part of the river vessels at low tide drawing 6 feet of water could reach Crumpton, 33 miles above the mouth, and from that point to Jones Landing, 6¼ miles, the controlling depth was 3 feet. Chester River rises in Kent County, Del., flows in a generally southwesterly direction and empties into the Chesapeake Bay. Its total length is about 50 miles. The length of the section included in the project is 6¼ miles, and its lower end is 33 miles above the mouth of the river.

Before the adoption of the present project there had been appropriated for this river $41,000, of which $2,958.54 was carried to the surplus fund on June 30, 1909, all of which was for work on parts of the river not covered by the existing project.

The existing project for improvement, adopted by the river and harbor act of September 19, 1890, is for a 6-foot mean low-water channel from Crumpton to Jones Landing, 60 feet wide, at an estimated cost of $12,750, increased in 1896 to $14,250, and still later to $19,562.50. There has been but one project for this section of the river.

Report on examination and survey upon which existing project is based will be found in the Annual Report of the Chief of Engineers for 1890, pages 954–959 (no maps). No modification has been made in the existing project since its adoption. Work under contract for maintenance was in progress during the year and resulted in restoring the channel to project dimensions.

The amount expended on the existing project to June 30, 1912, is $33,606.07, of which $15,946.59 is for maintenance.

To June 30, 1912, the project has been completed and the channel maintained to project dimensions.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the river was 6 feet. The mean range of tide is 2.4 feet. The length of the improved section is 6¼ miles. The head of navigation is Millington, Md., about 2 miles above Jones Landing.

The commerce of the river is reported to be as follows: 1906, 48,199; 1907, 49,162; 1908, 54,078; 1909, 54,618; 1910, 54,616; and for the year ending December 31, 1911, 68,709 short tons, consisting of agricultural products, canned goods, coal, fertilizers, general merchandise, oysters, poultry, and live stock, valued at $4,256,820.

The improvement has made no appreciable difference in water rates, but railroad rates have been reduced.

(*f*) *Choptank River, Md.*—Before improvements were begun in 1879 the depth of water in the channel between Denton and Greensboro varied from 2 to 8 feet. Navigation carried on by small sailing vessels extended to only 3 miles above Denton. Upon the remaining 5 miles to Greensboro all freight had to be transported upon scows. The headwaters of Choptank River are partly in Delaware and partly in Maryland in the section of country between Dover and Centerville. Its general direction is southwest until near Cambridge, where it turns to the northwest and empties into Chesapeake Bay. Its total length is about 70 miles. The length of the section included in the project is about 8 miles, the lower end of which is about 38 miles above the mouth of the river. There has been but one project for this river.

The existing project for improvement, adopted by the river and harbor act of June 14, 1880, is for an 8-foot mean low-water channel 75 feet wide from Denton to Greensboro, at an estimated cost of $79,000.

Report on survey is to be found in the Annual Report of the Chief of Engineers for 1880, pages 634–636, no maps. No modification has been made in this project since its adoption. Work under contract for maintenance was in progress during the year and resulted in restoring the channel to project dimensions except for a short distance at Greensboro.

The amount expended on the existing project to June 30, 1912, was $88,942.78, of which $9,946.44 was for maintenance. To June 30, 1912, the project has been completed and the channel maintained to project dimensions except a short reach at Greensboro.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel under improvement was 7 feet. The mean range of tide is about 2 feet. The length of the improved section of the river from Denton to Greensboro is about 8 miles. Greensboro, located about 46 miles above the mouth of the river, is the head of navigation.

The commerce of the river is reported to be as follows: 1903, 208,367; 1904, 210,447; 1905, 212,725; 1906, 208,496; 1907, 212,661; 1908, 233,916; 1909, 234,920; 1910, 237,273; and for the year ending December 31, 1911, 252,502 short tons, consisting of agricultural products, canned goods, coal, general merchandise, fish and oysters, and grain, valued at $19,803 144.

The improvement has made no appreciable difference in water rates, but railroad rates have been reduced.

It is proposed to apply the funds asked for to maintenance.

(*g*) *Warwick River, Md.*—This river, formerly named Secretary Creek, is in Dorchester County, eastern shore of Maryland, and flows into the Choptank River, one of the largest tributaries of Chesapeake Bay. It is a small tidal basin 2 miles long, with no fresh water influx at the head, and was originally only 4 feet deep. The length of the section included in the project embraces the entire river, and the lower end extends about one-half mile into the Choptank River.

The original project for the stream was adopted June 14, 1880, and provided for a channel 7 feet deep at mean low water and 75 feet wide. On this project about $12,000 was expended in the improvement of this river—$6,000 by the General Government and the remainder by private parties.

The existing project for improvement, adopted by the river and harbor act of July 13, 1892, provides for a channel 100 feet wide and

10 feet deep at mean low water from the 10 foot depth in Choptank River to Secretary Landing, at the head of the river, including a turning basin at the latter point, at an estimated cost of $18,600. The project was completed in July, 1903, but shoals formed rapidly.

The amount expended on the existing project to June 30, 1912, is $28,939.37, of which $12,898.55 was for maintenance.

To June 30, 1912, the project has been completed and the channel maintained to project dimensions.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel under improvement was 9½ feet. The average rise of tide is 2 feet. The length of the improved section of the river is about 1½ miles. The stream is navigable to Secretary Landing, which is the head of navigation.

The commerce of the river is reported to be as follows: 1903, 65,206; 1904, 65,858; 1905, 66,631; 1906, 60,027; 1907, 61,225; 1908, 67,346; 1909, 68,017; 1910, 68,595; and for the year ending December 31, 1911, 73,056 short tons, consisting of agricultural products, canned goods, coal, general merchandise, and oysters, valued at $3,719,623.

The improvement has made no appreciable difference in freight rates. Funds asked for will be applied to maintenance.

(*h*) *Wicomico River, Md.*—The river has its source in the northern part of Wicomico County, Md., is about 33 miles in length, and flows in a generally southwesterly direction, emptying into Monie Bay, a tributary of Tangier Sound. The length of the particular section included in the project is 3.4 miles, and the distance of its lower end from the mouth of the river is about 20 miles. The portion of the river at and just below Salisbury has been under improvement by the United States since 1872, under project adopted June 10, 1872, which is the original project. Originally the navigable channel, with a minimum depth of 8 feet at mean low water, extended to a point within 2 miles of Salisbury. The extreme upper portion as far as the mill dam in the heart of the town was quite shoal and had an average depth of only 18 inches at low tide. Between 1872 and 1885 a channel 75 feet to nearly 100 feet wide and 7 feet deep at mean low water was dredged from deep water below to the drawbridge in the town at a cost to the Government of $50,000.

The existing project, based upon a survey of the river in 1889, was adopted September 19, 1890, and provides for a channel 9 feet deep at mean low water from the 9-foot depth near Fruitland wharf to the drawbridge at Salisbury, the width to be from 100 to 150 feet, at an estimated cost of $23,200. This project was modified by the river and harbor act of June 25, 1910, to include an extension of the channel to the Salisbury mill dam, a distance of about four-tenths mile, 9 feet deep, with varying widths, and a turning basin at the upper end 650 by 360 feet, at an increased cost of $24,000, with not to exceed $600 annually for maintenance, subject to certain requirements regarding necessary right of way and for the disposition of dredged material to be deeded to the United States free of cost, making the total estimated cost of the existing project $47,200.

The existing project, with all modifications incorporated, is for a channel 9 feet deep at mean low water from the 9-foot depth near Fruitland Wharf to the milldam at Salisbury; widths to be from 100 feet to 150 feet to the Salisbury drawbridge, and above that point with varying widths and a turning basin at the upper end 650 feet by 360 feet. Work under contracts for improvement and maintenance was in progress at the close of the year with the results that the extension to the milldam was about 6½ per cent completed and the channel restored to fairly good condition. Work under the act of June 25, 1910, was delayed until the latter part of the fiscal year, owing to the fact that certain requirements of the act regarding the necessary right of way and for the disposition of dredged material, to be deeded free of cost to the United States, had not been complied with.

The amount expended on the existing project to June 30, 1912, was $45,598.93, of which $22,316 was for maintenance.

To June 30, 1912, the project has been about one-half completed and the channel kept in fairly good condition.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel under improvement, was 8½ feet below the bridge and about 1 foot above. The average rise and fall of the tide is 3 feet. The length of all improved sections of the river aggregate 3.4 miles. Salisbury, the head of navigation, is about 23 miles above the mouth of the river.

The commerce of the river is reported to be as follows: 1903, 197,306; 1904, 199,279; 1905, 202,510; 1906, 198,451; 1907, 202,416; 1908, 222,657; 1909, 224,983; 1910, 227,428; and for the year ending December 31, 1911, 362,545 short tons, consisting of agricultural products, canned goods, coal, fertilizers, general merchandise, lumber, oysters, shingles, laths, and cord wood, valued at $18,729,665.

The improvement has made no appreciable difference in water rates; railroad rates have been reduced.

It is proposed to apply the funds asked for in restoring the channel to project dimensions.

(i) *Pocomoke River, Md.*—The river has been under improvement by the General Government since 1878. Originally the upper portion of the river was very crooked and narrow at certain points, and the depth of but from 4½ to 5 feet at mean low water could be obtained to Snow Hill, Md. It rises in Great Cypress Swamp, partly in Delaware and partly in Maryland; it is about 50 miles in length, its general direction of flow is southwesterly and empties into Pocomoke Sound. The length of the particular section included in the project is about 4½ miles and its lower end is 24 miles above the mouth of the river. The original project is dated November 19, 1878, following an appropriation of $10,000 made in the river and harbor act of June 18, 1878, and was for a channel 7 feet deep with varying widths, between Snow Hill and Shad Landing. In 1879 and 1880, $12,500 was expended on work below Snow Hill, chiefly in the rectification of the channel and in giving increased width, the depth being 7 feet at mean low water. In 1888, with an appropriation of $8,000, a cut-off was made through the low neck of land forming four abrupt bends just below Snow Hill. At the close of these operations there was a channel not less than 80 feet wide and 7 feet deep between Snow Hill and Shad Landing, a distance of about 4½ miles. The amount expended in this project was $20,500.

The existing project, adopted by the river and harbor act of June 3, 1896, is based upon a survey made in 1894–95, and is for dredging a channel between Snow Hill and Shad Landing to a depth of 9 feet at mean low water and a width from 100 to 130 feet, at an estimated cost of $14,000. Reports on examinations and surveys are to be found in House Document No. 344, Sixty-first Congress, second session (no maps), and in the Annual Report of the Chief of Engineers for 1879 and 1895, pages 505–510, and 1167 (contains map), respectively. No modification has been made in the existing project. Work under contract for maintenance was in progress during the year, and resulted in restoring the channel to project dimensions.

To the end of the fiscal year $21,674.42 has been expended on the present project, of which $7,403.69 was for maintenance. To June 30, 1912, the project has been completed (about 1904) and the channel maintained at project dimensions.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel under improvement was 9 feet. The mean range of tide is 2½ feet. The length of the improved portion of the river is about 4½ miles. The head of navigation is about 2½ miles above Snow Hill, to which point, 30½ miles from the mouth, the stream is navigable in fact.

The commerce of the river is reported to be as follows: 1903, 245,568; 1904, 246,223; 1905, 67,165; 1906, 65,710; 1907, 67,024; 1908, 73,727; 1909, 74,459; 1910, 75,199; and for the year ending December 31, 1911, 78,644 short tons, consisting of agricultural products, bricks, canned goods, coal, general merchandise, and lumber, valued at $5,188,888.

The improvement has made no appreciable difference in freight rates.

(*j*) *La Trappe River, Md.*—This stream, formerly known as Dividing Creek, is a tributary of Choptank River. The controlling depth prior to 1893 was 4 feet, but was afterwards increased to 8 feet by dredging under private subscription. It is in the lower section of Talbot County, Md., and is a small tidal basin 3 miles long, with no fresh-water influx at its head. The length of the particular section included in the project embraces the whole river, its lower end being in the Choptank River.

The original project, which is the existing one, was adopted by the river and harbor act of July 13, 1892, and is for a channel 150 feet wide and 11 feet deep at mean low water across the bar at the mouth and for a width of 75 feet and a depth of 8 feet inside the bar as far as Trappe Landing, with a turning basin at the latter point, at an estimated cost of $7,250, subsequently increased to $9,750. Reports on examinations and surveys are to be found in the Annual Report of the Chief of Engineers for 1889 and 1891, pages 920–921 and 1215–1218, respectively (no maps). No modification has been made in the existing project. Work under contract for maintenance was in progress during the year and resulted in restoring the channel to project dimensions.

The amount expended on the existing project to June 30, 1912, is $15,708.68, of which $7,644.81 was for maintenance. To June 30, 1912, the project has been completed and the channel maintained at project dimensions.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel was 11 feet across the bar and 8 feet inside. The mean range of tide is 2 feet. The length of all improved sections is about 3 miles. Trappe Landing is the head of navigation, to which point the stream is navigable in fact.

The commerce of the river is reported to be as follows: 1903, 11,466; 1904, 13,601; 1905, 13,848; 1906, 13,588; 1907, 13,859; 1908, 15,244; 1909, 15,394; 1910, 15,549; and for the year ending December 31, 1911, 18,530 short tons, consisting of agricultural products, cans, coal, canned goods, fertilizers, general merchandise, and lumber, valued at $1,115,099.

The improvement has made no appreciable difference in freight rates.

It is proposed to apply the funds asked for to maintenance.

(*k*) *Manokin River, Md.*—Before improvements were commenced in 1891 the depth of water at the mouth of the river at the so-called "Mud Flats" was between 1 and 2 feet at mean low water. These flats are about 2½ miles wide and made navigation impossible except at high water, thereby rendering the upper part of the river, which has a very fair depth and width, almost useless for extensive shipping purposes. The river has its source in Somerset County, Md., flows in a generally southwesterly direction, and empties into Tangier Sound. The length of the section included in the project is 2½ miles and its lower end is 5½ miles above the mouth of the river.

The original project, which is the existing one, was adopted by the river and harbor act of September 19, 1890, and is based upon a survey made in August and September, 1889. It provides for a channel 6 feet deep at mean low water and 100 feet wide from Locust Point to Sharps Point, a distance of about 2½ miles and embracing the section called the "Mud Flats," at an estimated cost of $30,000. Increased May 13, 1907, to $42,103.99. Reports on examinations and surveys are to be found in House Document No. 398, Sixty-second Congress, second session (no maps), and in the Annual Report of the Chief of Engineers for 1890, pages 959–964. No modifications have been made in the existing project. Work under contract for maintenance was in progress at the end of the year, and resulted in partially restoring the channel to project dimensions.

The creation and maintenance of a channel across the mud flats at the mouth of the river is a work of some difficulty and uncertainty under the method adopted, which was originally considered as tentative only and the best that the commercial importance of the project would justify. Funds have not been available for adequate maintenance and the channel has always deteriorated rapidly.

The amount expended on the existing project to June 30, 1912, is $50,631.15, of which $17,843.10 was for maintenance and $2,000 additional was expended on the upper river, which is not included in the existing project. To June 30, 1912, the project has been completed and maintained in a generally good condition.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the channel was 5 feet. The average rise of tide is 2.6 feet. The length of the improved sections is about 2½ miles. Princess Anne is the head of navigation, to which point the river is navigable in fact. The length of all navigable portions of the river is 16 miles.

The commerce of the river for the year ending December 31, 1911, is reported to be 4,805 short tons, consisting of canned goods, coal, fertilizers, baled grass, lumber, and oysters, valued at $81,357.

The improvement has made no appreciable difference in freight rates.

(*l*) *Tyaskin Creek, Md.*—This stream is also known as Wetipquin Creek or River. It has its source in Wicomico County, Md., and flows in a generally westerly direction and empties into the Nanticoke River, being about 5 miles in length. The particular section included in the project is about 3,500 feet long, and its lower end extends into the Nanticoke River. The controlling depth in the creek was 8 feet, but on the bar at the mouth it was 3½ feet at mean low water. A survey was made in 1899. The original project was adopted by the river and harbor act of June 13, 1902, and was for a channel 9 feet deep at mean low water, with a width of 120 feet, at an estimated cost of $13,200. Under this project $10,158 was expended. The river and harbor act of March 2, 1907, appropriated $60,000 for improvement of rivers and harbors on the east shore of Chesapeake Bay, and $6,500 was allotted to complete this work, under a project based on a survey made in January, 1906, which provided for a channel 9 feet deep at mean low water, 120 feet wide, with a suitable turning basin at its upper end. This is the existing project and was estimated to cost $6,462.39. Reports on examinations and surveys will be found in House Document No. 109, Fifty-sixth Congress, first session, and House Document No. 682, Fifty-ninth Congress, first session, with maps, and in the Annual Report of the Chief of Engineers for 1900, pages 1681–1684. No modifications have been made in the existing project. Work under contract for maintenance was in progress during the year and resulted in restoring the channel to project dimensions, but some slight shoaling has since taken place.

The amount expended on the existing project to June 30, 1912, is $12,041.44, of which $5,902.81 was for maintenance. To June 30, 1912, the project has been completed and maintained in a fairly good condition.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the improvement was 8 feet. The average rise and fall of the tide is 3 feet. The length of the improved portion of the work is about 3,500 feet. The stream is navigable to Tyaskin, the head of navigation, which is about three-fourths mile from its mouth.

The commerce of the creek is reported to be as follows: 1903, 784; 1904, 796; 1905, 856; 1906, 945; 1907, 967; 1908, 1,064; 1909, 1,076; 1910, 1,087; and for the year ending December 31, 1911, 4,344 short tons, consisting of agricultural products, cans, canned goods, general merchandise, lumber, oysters, and watermelons, valued at $162,333.

The improvement has made no appreciable difference in freight rates. Funds asked for will be applied to maintenance.

Consolidated.

Amount (estimated) required to be appropriated for completion of existing project	$10,810
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	33,510

SUSQUEHANNA RIVER ABOVE AND BELOW HAVRE DE GRACE, MD.

The original governing depth was 5 feet at mean low water. The channel above Havre de Grace was narrow and subject to ice gorges. The river rises in the southern part of New York, flows in a general southerly direction, and empties into the head of Chesapeake Bay. Its length is about 400 miles. The length of the section included in the project is about 5½ miles, and the project extends about 5 miles below the mouth of the river. The original project is dated February 22, 1853, and was for a channel 12 feet deep and 100 feet wide, at an estimated cost of $59,000. Improvements have been in progress since 1853, and up to August 2, 1882, when the existing project was adopted, $97,390 had been expended upon them.

The existing project is to give a channel 200 feet wide and 15 feet deep at mean low water below Havre de Grace, and to remove the shoal opposite Watsons Island (which is above Havre de Grace) to a depth of 8 feet at the same stage of tide, at an estimated cost of $168,000.

Owing to shoaling which had taken place over the unimproved section of the project and the completed portion as well, since its adoption, the estimated cost of the project was increased December 2, 1911, to $200,750. Reports on examination and survey are to be found in House Document No. 396, Sixty-second Congress, second session (no maps), and on page 837, Annual Report of the Chief of Engineers for 1882 (no maps). There have been no modifications made in the existing project since its adoption. Work under contracts for improvement was in progress during the fiscal year, which resulted in extending the project 6,012 feet downstream and in restoring that portion previously dredged for 7,250 feet.

The amount expended on the present project to June 30, 1912, is $167,968.12, of which $18,480 was for maintenance. Work to June 30, 1912, has resulted in completing about three-fourths of the approved project, including the removal of the shoal opposite Watsons Island, to a depth of 8 feet. The maximum draft that can be carried June 30, 1912, at mean low water over the shoalest part of the channel under improvement is 12 feet. The mean range of tide is 2½ feet. The lengths of all improved sections of the river, including its prolongation to the head of Spesutie Island, aggregate about 5½ miles. The stream is navigable, in fact, to Port Deposit, Md., which is about 5 miles above the mouth of the river. The stream has been used for rafting and logging as far up as Williamsport, Pa.

The commerce of the river is reported to be as follows: 1905, 151,528; 1906, 82,673; 1907, 95,437; 1908, 37,927; 1910, 192,675; and for the year ending December 31, 1911, 352,335 short tons, consisting of canned goods, fertilizers, fish, ice, general merchandise, salt, stone, etc., valued at $2,864,688.

The improvement has made no appreciable difference in freight rates. Funds asked for will be applied to completing the project.

Amount (estimated) required to be appropriated for completion of existing project	$51,230
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	51,230

ANACOSTIA RIVER, D. C.

The Anacostia River, about 20 miles in length, rises in Maryland, flows in a southwesterly direction, and empties into the Potomac at Washington, D. C. The section under improvement is about 2 miles long, extending from Anacostia Bridge, near the navy yard, to the

Potomac River. Before improvement this section was from one-half to 1 mile wide; the channel was narrow, tortuous, and had the ruling depth of about 18 feet; between the narrow channel and the shore there were extensive flats with depths of 1 to 4 feet, which were covered in summer with aquatic grasses and plants. Sewage was discharged into the river and collected in the aquatic plants on the flats, which caused offensive and unhealthy conditions.

An allotment of $20,000 for work in the Anacostia was made from the appropriation of September 19, 1890, for improving Potomac River at Washington. Under this allotment channels 20 feet deep and about 200 feet wide were dredged through shoals near the foot of South Capitol Street and opposite Washington Barracks. This dredging was completed in May, 1892, at a cost of $18,536.94, and the balance, $1,463.06 was applied to the present project.

The existing project for this stream was adopted June 13, 1902, in accordance with plan printed in House Document No. 87, Fifty-fifth Congress, third session, which contains maps, and in the Annual Report of the Chief of Engineers for 1899, page 1443. It provides for the improvement of the portion of Anacostia River below the Navy Yard Bridge by dredging a channel 20 feet deep for a width of 400 feet, the depth then gradually decreasing to 6 feet at the bulkhead lines, and by depositing the dredged material on the adjacent flats to an average elevation of 7 feet above low tide, the reclaimed area to be surrounded by an earthen embankment to a height of 14 feet above low tide, protected by a masonry sea wall, and provided with suitable drainage through the embankment, all at an estimated cost of $1,218,525.

Maps of the locality will be found in the Annual Reports of the Chief of Engineers for 1903, 1904, 1905, 1906, and 1909.

A report relative to the title to Anacostia Flats is printed in House Document No. 194, Fifty-ninth Congress, first session; Senate Document No. 462, Sixty-first Congress, second session; and Senate Document No. 19, Sixty-second Congress, first session.

No modification of the existing project has been made to date.

The work of improvement during the fiscal year consisted in dredging, sea-wall work, embankment work, and the construction of floating plant. The work of maintenance during the fiscal year consisted in redredging, restoring sea-wall foundations, embankment work, and making repairs to floating plant and Government property. The total expenditure was $217,954.61, of which $20,839.58 was for maintenance work.

The amount expended on the existing project to June 30, 1912, was $545,524.40, of which $68,156.38 was applied to maintenance. As a result of this expenditure, a channel 1.8 miles long has been dredged to the full projected dimensions from the mouth to the upper limits of the navy yard, and some dredging has been done between the channel limits and the bulkhead lines. The amount of material excavated under various contracts, 5,190,257 cubic yards, and the amount dredged by private parties working under permits from but without cost to the Government, about 104,932 cubic yards, were deposited on the portions of the flats assigned for reclamation. In addition about 358,362 cubic yards of material have been dredged by other departments of the Government or private parties and deposited at other locations. Riprap foundations for masonry sea wall, containing 14,384.5 cubic yards of cobblestones and 67,322.8 cubic yards of riprap, have been built along the left bulkhead line for a distance of about 12,300 feet; 1,400 linear feet of sea wall have been constructed; 791 piles of the old dismantled wharf opposite the navy yard have been removed; and 340 acres of flats have been reclaimed or partially reclaimed by the deposit of excavated material. Harbor lines from the mouth of the river to Massachusetts Avenue were established in June, 1904.

The entire project is now about 50 per cent completed.

The improvement already made has been of great benefit to navigation and has resulted in the diversion of considerable traffic from the Washington channel, where conditions were rapidly becoming congested.

Health conditions in the portion of the city bordering on the Anacostia River are greatly improved.

The maximum draft that could be carried on June 30, 1912, over the shoalest part of the locality under improvement was 21 feet. The mean range of tide is about 3 feet.

Anacostia River is navigable for large vessels to the Navy Yard Bridge, for tugs and small vessels to Pennsylvania Avenue Bridge, and for small scows and lighters to Bladensburg, Md., respectively, 2, 2¾, and 8¾ miles above its mouth.

The principal articles of commerce in the order of their relative values are naval ordnance and supplies, powder-making materials, oils, brick, sand and gravel, coal, paving blocks, stone, lumber, asphalt, brick clay, iron and steel, and cordwood. The receipts and shipments during 1911 amounted to 335,347 short tons and were estimated to be worth $31,567,750.

This increase in value is due to the fact that much better statements were secured from the officers in charge of the navy yard and naval proving grounds than in previous years.

It is not known that any reduction in freight rates has resulted from the work done.

The funds, $75,000, asked for the fiscal year 1914, will be used for dredging, sea-wall work, and prosecution of the work of improvement.

Amount (estimated) required to be appropriated for completion of existing project	$518,062.57
Amount that can be profitably expended in the fiscal year ending June 30, 1914, for works of improvement	75,000.00

POTOMAC RIVER AT WASHINGTON, D. C.

The Potomac River rises in West Virginia, in the Allegheny Mountains, and, flowing in a southeasterly direction 410 miles, empties into Chesapeake Bay.

The portion included in this project extends from the Aqueduct Bridge downstream 5 miles to Giesboro Point, D. C., which is 108 miles from the mouth of the river.

Before improvement the channel was obstructed by two bars—the lower bar, near Giesboro Point, on which the minimum depth at mean low water was 14 feet, and the upper bar, extending upstream 1 mile from the Highway Bridge, in what is known as Virginia Channel, on which the minimum depth at mean low water was 8 feet.

The minimum depth at mean low water in the Washington Channel was 10 feet. Georgetown Harbor was obstructed by several dangerous rocks. The flats, which extended to the edge of the Virginia Channel, were largely bare at low water and were an active agent in spreading malarial and other diseases.

In 1849, $1,500 was appropriated for a survey of the river. Of this sum $1,208.61 was expended, and the balance of $291.39 covered into the surplus fund of the Treasury.

Between June 11, 1870, and March 3, 1881, the sum of $290,000 was appropriated by Congress for the improvement of the harbors of Washington and Georgetown. The project under which this last-mentioned sum was expended, is not definitely stated, although it is understood that it provided for dredging channels 15 feet deep and 200 feet wide through the Georgetown and Washington Channels and for the removal of the most dangerous rocks obstructing navigation in the harbor of Georgetown to a depth of 20 feet.

The existing project for the improvement, estimated to cost $2,500,000, was adopted August 2, 1882, and is contained in Senate Executive Document No. 126, Forty-seventh Congress, first session, which contains maps, and also in the Annual Report of the Chief of Engineers for 1882, page 980.

The project has for its object the improvement of the navigation of the river by widening and deepening its channels, the reclamation of the flats by depositing on them the material dredged from the channels, the freeing of the Washington Channel of sewage, and the establishment of harbor lines. To effect these, the project provided "that the channel depths * * * should be sufficient to accommodate the largest draft vessels that can be brought up to Arsenal Point" (the projected depth was not stated in feet, but by the above-imposed condition was at that time limited to 20 feet at low tide, whereas the ruling depth in the Potomac River below Washington has now been increased by dredging to 24 feet at low tide), that the flats be reclaimed to a height of 3 feet above the flood plane of 1877 (which, although the highest recorded freshet at that time, was exceeded by about 3 feet by the flood of 1889), and for a tidal reservoir to be provided with automatic inlet and outlet gates. A training dike on the Virginia shore extending downstream from Analostan Island was added to the project in 1890. The project also provided for the rebuilding of Long Bridge and for the interception of all sewage discharged into the Washington Channel, but neither of these works was included in the estimated cost of the improvement. The estimated cost was increased in 1883 to $2,716,365, and in 1897 was increased to $2,953,020 to provide for shrinkage and settlement of material in fills. The existing project provides for dredging the Virginia Channel 20 feet deep and of sufficient width to afford a low-water cross-sectional area of 25,000 square feet; for dredging the Washington Channel 20 feet deep, for the reclamation of the flats to 3 feet above the freshet elevation of 1877, by depositing the dredged material thereon; for the construction of a tidal reservoir to periodically flush the Washington Channel; for the establishment of harbor lines; and for the construction of a training dike in the Virginia Channel, at an estimated cost of $2,953,020.

The amount expended on the work of the existing project to June 30, 1912, was $3,013,690.97, of which $572,257.46 has been applied to maintenance since March 3, 1899. The following sums have been obtained from other sources than appropriations: Received from sale of blue prints, 50 cents; of condemned property, $331.08; total, $331.58.

This expenditure resulted in obtaining the following channels by dredging: Virginia Channel, 4 miles long, about 500 feet wide, and 20 feet deep; Washington Channel, 2¾ miles long, having a 400-foot width to a depth of 24 to 26 feet and a 350-foot width to a depth of 18 to 20 feet; in dredging the tidal reservoir to a depth of 8 feet over its entire area (111 acres); in fully reclaiming Potomac Park with the dredged material; in completing the inlet and outlet gates for the tidal basin; in constructing 36,975 linear feet of sea wall around the reclaimed area and rebuilding 26,239 linear feet thereof; in building 5,965 linear feet of training dike to the height of 6 feet above mean low water and restoring this height, where settlement had occurred, for 4,060 linear feet thereof (the total amount of riprap used in the construction and maintenance of the training dike is about 28,198.9 cubic yards); and in removing dangerous rocks from the Georgetown Harbor. The above-mentioned channels have been redredged from time to time for maintenance, thereby removing freshet accretion. The total amount of material dredged from these channels and deposited on the flats is about 15,712,870 cubic yards, paid for under the various contracts, and about 3,383,235 cubic yards, not paid for, owing to excavation being carried beyond the limits specified in the various contracts. The amount of material received from private parties working under permits without cost to the United States and deposited on the flats is about 922,200 cubic yards. The area of land reclaimed by these operations is 628 acres (including reservoir, 739 acres), which by act of March 3, 1897, was declared to be a public park, under the name of Potomac Park. The upper part of this park having been completed was turned over to the office of Public Buildings and Grounds, and subsequently was developed by that office into one of the most beautiful parks of this country.

The work of the project is now about 82 per cent completed and the benefits to navigation and general health of the community derived from the improvement have been most marked. Larger and deeper draft vessels are now engaged in trade and it is understood that freight rates have been materially reduced from those formerly charged. The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the Washington Channel was 24 feet and of the Virginia Channel 17.5 feet. The mean range of tide is about 3 feet. The Potomac River is navigable to the foot of Little Falls, 3½ miles above Georgetown, but the Aqueduct Bridge, which crosses the river at Georgetown, 113 miles above the mouth of the river, has no draw and limits the navigation of large steamers and masted vessels.

The principal articles of commerce, in the order of their relative values, are general merchandise, coal, fish, oils, lumber, oysters and clams, sand and gravel, gasoline, produce, stone, manufactured iron and steel, melons, crabs and crab meat, fertilizer, laths, canned goods, asphalt, and ice. The receipts and shipments during 1911 amounted to 795,900 short tons and were estimated to be worth $12,995,447.

The funds, $30,000 asked for for the fiscal year 1914, will be used for maintenance of channels, sea walls, inlet and outlet gates of tidal reservoir, and other work incidental to the maintenance of improvement.

July 1, 1912, amount covered by uncompleted contracts	$16,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	30,000

POTOMAC RIVER AT LOWER CEDAR POINT, MD.

Lower Cedar Point is a long, narrow point of land projecting into Potomac River on the left bank of the river about 61 miles below Washington. On its southern side a wharf of commodious capacity is used as a shipping point for persons residing within a radius of 6 or 7 miles. The ruling depth was 7 feet in 1907. Twenty or twenty-five years ago the channel was dredged to a depth of about 10 feet at the expense of private parties. Portions of this channel gradually shoaled until the width was not sufficient for navigation.

The existing project for the improvement, adopted by the river and harbor act of June 25, 1910, provides for dredging a channel 150 feet wide and 10 feet deep to Dills Wharf by way of the "west channel," with a turning basin at the wharf of the same depth, 300 feet wide and 400 feet long, the aggregate length of channel and turning basin being about two-fifths mile, in accordance with plan printed in House Document No. 918, Sixtieth Congress, first session, which contains map. The estimated cost of this project is $13,300, with an additional charge of about $600 a year for maintenance.

The work of the fiscal year consisted in rebuilding dredge *Dalecarlia* and fitting up floating plant, and the incidental expenditure thereto, $3,066.49, was applied to maintenance.

The amount expended on the existing project to June 30, 1912, was $13,300, of which $3,066.49 was applied to maintenance. The expenditure resulted in completing the project by dredging the channel and turning basin, aggregating 1,950 feet in length and to full projected width and depth. The amount excavated was 35,297 cubic yards.

A map of the locality may be found in House Document No. 918, Sixtieth Congress, first session, containing the report on examination and survey, and in the district officer's report of this fiscal year, and in Annual Report of the Chief of Engineers for 1911, page 1450.

No modification of the existing project has been made.

All work of the approved project has been completed. The benefits to navigation derived from the improvement consist of allowing steamers of fully 3 feet deeper draft to land at this port, making it possible for the steamers of the Washington and Baltimore line to trade at this port. The maximum draft that could be carried over the shoalest part of the locality on June 30, 1912, was 10 feet at mean low water. The mean range of tide is about 1.8 feet. The principal articles of commerce in the order of their relative values are general merchandise, live stock, tobacco, manufactured iron and steel, farm produce, grain and seeds, fertilizer, flour, and building materials. The receipts and shipments during 1911 amounted to 1,755 short tons, and were estimated to be worth $120,392.

It is not known that freight rates have been reduced.

The funds, $3,000, asked for for the fiscal year 1914 will be applied to redredging and maintenance of improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$3,000

HARBOR AT NORFOLK, VA.—GENERAL IMPROVEMENT.

The city of Norfolk, Va., lies on the Elizabeth River and its branches about 9 miles from its mouth in Hampton Roads. The improvement of its harbor has included the improvement of the channel of the main river for this length of 9 miles and, in addition, the improvement of each of its three branches for a distance of about 1 mile from their junction with the main river, and also the dredging of an anchorage basin at the mouth of the Western Branch, having an area of 56 acres and a depth of 25 feet at mean low water. Norfolk is 37 miles by water southwest of Cape Charles City Harbor, Va., and 187 miles by water south of Baltimore, Md.

In its original condition the main channel of this harbor was at mean low water navigable by vessels of 20 feet draft as far as the navy yard on the Southern Branch of the Elizabeth River, while in the Eastern Branch of this river there was a channel 15 feet in depth at mean low water as far as the Campostella Bridge. These channels were of varying width.

The original project of improvement was adopted in 1878, revised in 1885, and amended in 1890, 1898, and 1905. It included the attainment of a channel from 500 to 700 feet wide and 25 feet deep at mean low water from Hampton Roads to the navy yard, a distance of about 10 miles, a branch channel 22 feet deep at the same stage of the tide, to the Campostella Bridge on the Eastern Branch, a distance of about 1 mile, and, within the limits of the first-named channel, a channel 450 feet wide and 28 feet deep at mean low water from deep water in Hampton Roads to the navy yard. There has also been included in the project the excavation of an anchorage at the mouth of the Western Branch, having an area of 56 acres and a depth of 25 feet at mean low water, and the dredging, to the depth of 28 feet, at mean low water, of the area between the western edge of the main channel and a line 75 feet outside of the established pierhead line, along the railroad docks at Pinner Point. The cost of all this work was estimated at $1,623,790.98.

The existing project of improvement is the original project, modified from time to time as stated above, under which the first appropriation for work was made August 14, 1876.

The original project of improvement, modified from time to time as stated above, has been entirely completed.

During the fiscal year no work was done. The expenditures were for the payment of retained percentages.

To June 30, 1912, there had been expended on this project—$1,674,361.13, of which sum $51,956.07 was for work of maintenance. The sum of $38.21 has been derived from the sale of property and blue prints.

The completion of the approved project increased the depth in the main channel of the harbor at mean low water to 28 feet from Hampton Roads to the navy yard, a distance of about 10 miles. The depth in the channel of the Eastern Branch is 22 feet to the Campostella Bridge, about 2 miles from its mouth. Above this bridge it has not been improved, but in the natural channel a draft of about 10 feet can be carried to a point some 4 miles from its mouth.

The normal tidal range is 2.7 feet.

For the calendar year 1911, the water-borne shipments aggregated 14,445,112 short tons, value not known. The chief products handled are coal, cotton, fertilizer, forest and agricultural products, and general merchandise. The improvement has made Norfolk an important shipping point for bituminous coal from the West Virginia fields.

It has not been found practical to ascertain what effects, if any, the improvement has had on freight rates.

The amount estimated for expenditure in the fiscal year 1914 will be applied to dredging, if necessary, to maintain the project depth and width of the channel.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

HARBOR AT NORFOLK AND THE APPROACHES THERETO AND THE CHANNEL TO NEWPORT NEWS.

(*a*) *Harbor at Norfolk and the approaches thereto.*—The existing project for improvement adopted by the river and harbor act of June 25, 1910, provides for dredging a channel 400 feet wide and 35 feet deep at mean low water from deep water in Hampton Roads to the navy yard at Portsmouth, Va., a distance of about 11 miles, at an estimated cost of $800,000.

Reports upon an examination and survey of this improvement are printed in House Document No. 551, Sixty-first Congress, second session; no maps.

No modification of the existing project since its adoption has been made.

The dredging in the reach between the Belt Line Railway bridge and the junction of the Eastern and Southern Branches, which was in progress at the close of the last fiscal year, was completed to the project width and depth. The channel was also completed to the project width and depth in reaches Nos. 1 and 2 between the junction of the branches and Lamberts Point, a distance of about 3 miles, and to the project depth for a width of 200 feet for a further distance of 15,700 feet in reach No. 3, between Lamberts Point and Bush Bluff Lightship.

The sum of $231,784.49 was expended during the fiscal year for dredging and contingencies.

The expenditures on the existing project to June 30, 1912, have amounted to $329,687.49.

The sum of $63.03 has been received from sales.

The dredging is being done under a continuing contract, and the balance of the authorization remaining to be appropriated is $175,000.

At the close of the fiscal year work was still in progress, and the adopted project was about 59 per cent completed.

The statements contained in section (*a*) of the current summary upon harbor at Norfolk, Va., regarding the character and volume of commerce, tidal range, and the effect of the improvement on freight rates apply also to this improvement. On June 30, 1912, vessels of 30 feet draft could proceed from deep water in Hampton Roads to the navy yard.

The amount required for expenditure during the fiscal year ending June 30, 1914, will be applied to dredging for the purpose of continuing the improvement.

Amount of continuing contract authorization, act of Feb. 27, 1911	$340,000
Amount appropriated under such authorization	165,000
Amount yet to be appropriated	175,000
Amount (estimated) required to be appropriated for completion of existing project	245,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	238,000

(*b*) *Thimble Shoal.*—This shoal extends from a point about 1¼ miles eastward of Thimble Shoal Lighthouse, Chesapeake Bay, in a southeast direction, toward the entrance to the bay from the ocean. It is about 5 miles long, with a minimum depth of 30 feet at mean low water.

The existing project for the improvement, adopted by the river and harbor act of June 25, 1910, provides for dredging a channel about 5 miles long, 500 feet wide, and 35 feet deep at mean low water, at an estimated cost of $660,000, in accordance with report printed in House Document No. 551, Sixty-first Congress, second session.

No modification of the existing project, since its adoption, has been made.

During the fiscal year dredging was done throughout the channel, and on June 30, 1912, the available channel depth is not less than 33 feet for its entire length and for nearly its entire width. The project on that date is 83 per cent completed.

During the fiscal year a survey was made to determine the amount of work still required on the Thimble Shoal channel, and the result showed that the total amount of material removed and to be removed would be much less than the original estimate, which estimate was based upon information derived from a Coast and Geodetic Survey chart, there being no other data available at the time. The contract price for the work is much lower than was originally estimated, and it now appears that the project can be completed at a total cost of $360,000 instead of $660,000, as originally estimated, a reduction of $300,000.

The sum of $100,881.28 was expended during the fiscal year for dredging and contingencies.

The expenditures to June 30, 1912, have amounted to $159,869.36.

On June 30, 1912, a vessel drawing 33 feet could pass through Thimble Shoal at mean low water. The range of tide is 2.5 feet.

The commerce passing to and from the ocean between the Virginia capes, bound to and from Norfolk, Va., and Newport News, Va., uses this Thimble Shoal channel. For details as to the commerce of these two harbors, see the current summary; also as to heads of navigation, etc.

The amount recommended for appropriation for the fiscal year ending June 30, 1914, will be applied to dredging for the purpose of continuing the improvement.

Amount (estimated) required to be appropriated for completion of existing project	$125,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	125,000

(*c*) *South Branch of Elizabeth River.*—This river extends southward in a sinuous course from its junction with the East Branch of the Elizabeth River to the locks of the Albemarle & Chesapeake Canal at Great Bridge, Va., a distance of about 11 miles. At a point about 6 miles above the junction of the branches, Deep Creek joins the South Branch, the former continuing to the locks of the Dismal Swamp Canal, about 3 miles from the junction. The channel depth to the locks of both canals is about 10 feet at mean low water, and prior projects for the improvement of the South Branch covered the dredging of shoals north of the locks at Great Bridge for a distance of about 5 miles under a project for the improvement of the rivers, sound, and bay, forming, in conjunction with the land cuts of the Albemarle & Chesapeake Canal, an inland waterway to Albemarle Sound, N. C.; in the lower reaches of the South Branch the channel has been dredged, first to 25, then to 28, and then to 35 in feet depth at mean low water, to the navy yard, about 1¼ miles above the mouth, under appropriations for improving the harbor of Norfolk, Va.

In the lower reaches of the South Branch, the natural channel from the Belt Line Railway bridge, about 1½ miles above its mouth, for about 1½ miles upstream, had a depth of about 18 feet at mean low water, and thence to the Norfolk & Western Railway bridge, about 2 miles farther, a depth of about 12 feet at mean low water. Above the Belt Line Railway bridge this channel at many places was very narrow and for its entire length very tortuous.

The project of improvement, adopted by the river and harbor act of June 25, 1910, is to provide, by dredging, a channel from the Belt Line Railway bridge to a point about 1½ miles above, 300 feet wide and 25 feet deep at mean low water, and thence to the Norfolk & Western Railway bridge, a further distance of about 2 miles, 200 feet wide and 22 feet deep at mean low water, at an estimated cost, including the easing of abrupt turns, of $222,500, in accordance with plan printed in House Document No. 551, Sixty-first Congress, second session.

No modification of the existing project since its adoption has been made.

Reports upon examinations and surveys of this locality are printed as House Documents No. 373, Fifty-ninth Congress, first session, and No. 551, Sixty-first Congress, second session, with map.

During the fiscal year dredging to the project width and depth was done from a point about 1½ miles above the Belt Line Railway bridge to the Norfolk & Western Railway bridge, completing the project.

The amount of material actually removed proving to be less than had been estimated, and the prices obtained for dredging being less than had been expected, the total cost of this project was only $187,500, instead of $222,500 as originally estimated, a reduction of $35,000.

The sum of $81,384.77 was expended during the fiscal year for dredging and contingencies.

The expenditures to June 30, 1912, have amounted to $131,861.69.

During the year work was carried on under a continuing-contract authorization for which the sum of $2,500 still remains to be appropriated, but will not be needed.

The project has been completed.

On June 30, 1912, a draft of 25 feet could be carried at mean low water over the stretch of the river from the Belt Line Railway bridge to a point about 1½ miles above, and for the remainder of the distance to the Norfolk & Western Railway bridge, 22 feet. This river, in connection with private canals and the inland water routes to Albemarle Sound, N. C., is the northern outlet to Chesapeake Bay and Hampton Roads and their tributaries of sounds, bays, and rivers in northeastern North Carolina. The distance from Norfolk by either of the canal routes to Albemarle Sound is about 67 miles, and the depth available in each is about 9 feet at mean low water.

The commerce of the river over the distance covered by the project amounted to about 646,253 short tons in the calendar year 1908, valued at $5,942,855. In the calendar year 1911 it is reported at 695,706 short tons, value not known. The articles transported are coal, forest products, iron, chemicals, oil, and fertilizer. In addition to the tonnage stated, the traffic by way of the two inland waterways, of which the river channel forms a part, in the calendar year 1911 aggregated 674,447 short tons.

It has not been possible to ascertain the effect the improvement has had on freight rates. Its completion, however, has enabled shippers to load and unload vessels alongside their wharves instead of lightering much of the cargoes of incoming and outgoing vessels which formerly had to be anchored, in some cases, at least 4 miles from the wharves. This discontinuance of the necessity for lightering will decrease the cost of loading and unloading vessels.

The amount recommended to be appropriated for the fiscal year ending June 30, 1914, will be applied to maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

(*d*) *The channel to Newport News.*—Before any improvement was made of this locality, vessels of 25 feet draft could proceed to Newport News at mean low water. Under a project adopted June 13, 1902, a channel 500 feet wide and 30 feet deep at mean low water was dredged south of Middle Ground Light, in Hampton Roads, Va., through the shoal known as "Middle Ground Bar," the sum of $225,000 having been appropriated and expended therefor. In addition, $12,500 have been applied to maintaining the dredged channel.

The project adopted by the river and harbor act of June 25, 1910, provides for dredging a channel 400 feet wide and 35 feet deep at mean low water, for a distance of about 3¼ miles, through the shoal north of Middle Ground Light, in Hampton Roads, Va., at an estimated cost of $465,000.

No modification of the existing project, since its adoption, has been made.

Reports, with maps, upon an examination and survey of the locality are printed as House Document No. 550, Sixty-first Congress, second session. For other details and references see the current summary for Norfolk Harbor (general improvement).

During the fiscal year dredging was done for a width of 200 feet for the entire length of the channel and for an additional width of 100 feet for a length of about 2 miles. On June 30, 1912. the project was 99.5 per cent completed.

The sum of $135,630.27 was expended during the fiscal year for dredging and contingencies.

The expenditures to June 30, 1912, have amounted to $247,401.51.

During the year work was carried on under a continuing-contract authorization for which the sum of $20,000 still remains to be appropriated, but will not be needed.

This channel is not yet in use, but as soon as the small amount of work remaining to be done is finished and the channel properly marked it will be available for vessels drawing 35 feet. The normal tidal range is 2.7 feet.

For the calendar year 1911 the water-borne shipments to and from Newport News, which this channel will serve, aggregated 6,307,501 short tons. The chief commodities handled are coal, fertilizer, forest and agricultural products, and general merchandise. The completion of this improvement will render much easier and more direct the approach to the harbor of Newport News.

The estimated amount required for expenditure in the fiscal year ending June 30, 1914, will be applied to dredging under the adopted project for maintaining the improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$15,000.00

Consolidated.

July 1, 1911, balance unexpended	705,883.79
Received from sales	40.00
	705,923.79
June 30, 1912, amount expended during fiscal year, for works of improvement	549,680.81
July 1, 1912, balance unexpended	156,242.98
Amount appropriated by sundry civil act approved Aug. 24, 1912	425,000.00
Amount available for fiscal year ending June 30, 1913	581,242.98
July 1, 1912, outstanding liabilities	305,625.89
July 1, 1912, amount covered by uncompleted contracts	363,131.11
Amount of continuing contract authorization, act of Feb. 27, 1911	622,500.00
Amount appropriated under such authorization	425,000.00
Amount yet to be appropriated	197,500.00
Amount (estimated) required to be appropriated for completion of existing project	[1] [2] 697,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	[3] 363,000.00
For maintenance of improvement	20,000.00
Total	[1] [3] 383,000.00

WESTERN BRANCH OF ELIZABETH RIVER, VA.

The channel of the river, when the project for improvement was adopted, was 12 feet deep at mean low water and from 50 to 300 feet wide.

The project adopted June 3, 1896, provided for obtaining, by dredging, a channel 200 feet wide and 20 feet deep at mean low water for a distance of about 1 mile from deep water in Norfolk Harbor. The estimated cost was $45,000, all of which has been appropriated.

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[1] Exclusive of amount available for fiscal year 1913.

[2] This is the unappropriated balance of the original estimate. It is now expected to complete the work for $370,000.

[3] Of this amount, $197,500 is for continuing contract work authorized by the act of 1911.

No modification of the original project, since its adoption, has been made.

The project adopted by the river and harbor act of February 27, 1911, for "Improving harbor at Norfolk, Va.," provided $5,000 for maintenance of improvement, including this branch. For present adopted project for improving harbor at Norfolk, Va., see House Document No. 551, Sixty-first Congress, second session; for adopted project for the Western Branch of the Elizabeth River, Va., see House Document No. 331, Fifty-fourth Congress, first session.

No work was done and no expenditures were made during the fiscal year.

Up to June 30, 1912, the sum of $44,671.65 has been expended on improvement and $5,000 for its maintenance. The project has been completed.

A draft of 20 feet at mean low water can be carried in the improved channel, which is about 1 mile in length. The average rise and fall of the tide is 2.7 feet.

This stream is navigable for small sailboats to farms situated about 9 miles from its mouth.

The commerce in the main consists of manufactured lumber, ore, and farm products, and has increased since improvement. For the calendar year 1911 it is reported to have amounted to 1,771,576 short tons, value not known.

It has not been found possible to ascertain what effect, if any, the improvement has had upon freight rates.

July 1, 1911, balance unexpended	$5,000
July 1, 1912, balance unexpended	5,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	5,000

The Western Branch of Elizabeth River flows between the town of Port Norfolk and West Norfolk and empties into the main river about 2 miles below the junction of its Eastern and Southern Branches From the drawbridge which crosses this stream a short distance above its mouth the distance to the main channel of Elizabeth River is only about 1 mile. This short mile reach of the river is the only portion which has ever been improved by the United States. When the project for its improvement was adopted, the channel depth was only about 12 feet at mean low water, the channel varying in width from about 50 feet to about 300 feet.

Since the completion of the present project, about 1897, the only work done upon this stream has been the maintenance of the project width and depth of channel by dredging where deterioration had taken place.

The traffic in the Western Branch of the Elizabeth River has increased rapidly. In 1896 it is reported to have been a little over 200,000 tons, in 1903 it had increased to over 1,200,000 tons, and for the fiscal year 1909 it is reported to have been something over 1,800,000 tons. Of this total over 95 per cent was carried on car floats and consisted of machinery, dry goods, groceries, structural iron and steel, and other miscellaneous articles. It has been impossible to ascertain the quantities of the different items; but it is stated that $50 per ton is a very conservative estimate of the average value of all this railroad freight.

The following letter of the Chief of Engineers, submitting report on a recent examination is printed in House Document No. 566; Sixty-second Congress, second session.

War Department,
Office of the Chief of Engineers,
Washington, February 21, 1912.

Sir: I have the honor to submit herewith, for transmission to Congress, reports dated June 10, 1911, by Lieut. Col. Mason M. Patrick, Corps of Engineers, and August 26, 1911, with map, by Lieut. Col. W. C. Langfitt, Corps of Engineers, on preliminary examination, with plan and estimate of cost of deepening and widening the approach to the Western Branch of Elizabeth River, Va., called for by the river and harbor act approved February 27, 1911.

Under an existing project the Federal Government has made in this river a channel 200 feet wide and 20 feet deep at mean low water for a distance of about 1 mile up from deep water in Norfolk Harbor.

The district officer recommends the adoption of a plan for widening this channel to 300 feet up to the first turn below the existing bridge, deepening to 24 feet at mean low water throughout up to the bridge, and removing the shoal on the north side of the junction of this branch with the main river to a depth of 16 feet, all as shown on the accompanying map, estimated to cost $82,000 with $2,000 annually for maintenance.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and the board concurs in the opinion that the Western Branch of Elizabeth River, including the approach thereto, is worthy of improvement in the manner indicated.

After due consideration of the above-mentioned reports, I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore in carrying out the instructions of Congress I report as follows: That the improvement by the United States of the Western Branch of Elizabeth River, Va,. including the channel of approach, is deemed advisable so far as to secure an available channel depth of 24 feet and a channel width of 300 feet up to the first turn below the existing bridge and remove the shoal above mentioned to a depth of 16 feet, following in general the methods described in the report of the district officer, at an estimated cost of $82,000 for first construction and $2,000 annually for maintenance, these estimates being based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under an appropriation of the entire estimated cost.

Very respectfully,

W. H. Bixby,
Chief of Engineers, U. S, Army.

The Secretary of War.

JAMES RIVER, VA.

The original condition of the James, before its improvement by the General Government was begun in 1870, was as follows:

The ruling depth to the lower city line of Richmond was 7 feet at mean low water. This depth obtained on Rocketts Reef, immediately below Richmond, and on Richmond Bar, 2 miles below. Some 15 miles lower down, in Trents Reach, was a shoal on which there was a depth of only 8 feet. This, however, ceased to be an obstruction in January, 1872, when the 5-mile reach in which it was situated was cut off by the opening of Dutch Gap Canal.

In addition to the above natural obstructions there were, in the 10 miles of river below Richmond, wrecks in the channel at Chaffins Bluff and Graveyard Reach, and obstructions placed during the Civil War at Warwick Bar and Drewry Bluff, consisting at each locality of a military bridge, lines of stone cribs, and sunken vessels. In addition to all these obstructions, the channel between Richmond and Trents Reach was in many places narrow and tortuous.

Between Trents Reach and City Point, a distance of 18½ miles, the ruling depth was 13 feet, which obtained near Varina or Aikens Landing. Between City Point and the mouth of James River the ruling depth was 15 feet, existing at Harrisons Bar and Goose Hill flats, then 43 and 76 miles, respectively, below Richmond.

The existing project comprises excavating a channel 22 feet deep at mean low water between the mouth of the river at Hampton Roads and the Virginia & Kanawha Canal ship lock at the lower end of the docks, Richmond, Va., of the following widths: From the river's mouth to City Point, 400 feet; from City Point to Drewry Bluff, 300 feet; and from Drewry Bluff to the head of navigation at the docks, 200 feet, except for a distance of 600 feet, beginning about 600 feet below the ship lock, where the channel width is to be 400 feet, to serve as a turning basin. The total estimated cost of the improvement is $5,374,943.15.

The amount expended on the present project to June 30, 1912, was $2,104,860.95, of which $70,520.93, expended subsequent to March 3, 1899, was for maintenance. This item of maintenance includes the cost of dredging sand and mud deposited in the channel of the river during the execution of the work in excess of the quantity originally estimated, and also repairs to jetties.

Until November 30, 1910, the improvement of the river was confined chiefly to its upper reaches, where the water was shoalest and the channel rocky, and consequently where the greatest benefits to commerce would be obtained. The exceptions to this were the dredging of shoals at Harrisons Bar, Swans Point Shoal, and Goose Hill Flats to a depth of 18 feet.

In 1910 the improvement of the upper reaches being sufficiently advanced to give a channel with a depth of 18 feet and a minimum width of 100 feet, the excavation of channels on the shoals between City Point and the mouth of the river, to give them a depth of 20 feet and the width of 400 feet prescribed in the project, was begun and has been completed for City Point, Dancing Point, Swans Point, and Rocklanding Shoals. A channel on Harrisons Bar 20 feet deep, having widths of 250 to 400 feet, has been completed, and work has been begun on Goose Hill Flats, with a view to forming a channel 400 feet wide by 20 feet deep.

The project is estimated to be about 39.1 per cent completed.

The result of the work of improvement is a channel from Hampton Roads to within about 100 feet of the city wharf at Richmond, having a width of not less than 100 feet and a depth of 18 feet at mean low water, except on Goose Hill Flats, where for a short distance the width is less than 100 feet.

The maximum draft that could be carried at low water on June 30, 1912, between Richmond and the mouth of the river was 17 feet.

The mean tidal range varies for different parts of the river, being approximately as follows: 2½ feet at Fort Monroe, 1.85 feet at Jamestown, 3 feet at City Point, 3½ feet at Dutch Gap, and 4 feet at Richmond.

The channel length of the James River from Hampton Roads to the head of navigation at Richmond, Va., for steamers and other craft is 103.8 miles. The river is navigable for rafting and logging for about three-fourths mile above the head of navigation for steamers.

The commerce of the river for the calendar year 1911 amounted to 472,537 short tons, having an estimated value of $27,004,595. Of the above, 285,126 short tons, having an estimated value of $25,095,183, represent the part of the commerce and its value for the port of Richmond, Va.

The above statistics, as compared with those for the calendar year 1910, show a decrease in the total of James River tonnage of about 9.8 per cent and an increase in value of about 6 per cent. A comparison of the statistics for the port of Richmond, Va., for the above periods shows an increase in tonnage of about 4.3 per cent and an increase in value of about 9.1 per cent.

The principal articles of commerce comprised general merchandise, logs, lumber, cordwood, railroad ties, brick, coal, coal oil, fertilizer, and fertilizer material.

The work done has been beneficial in reducing the cost of water transportation of lumber, fertilizer material, coal, and other articles carried principally in sailing vessels and barges. In many instances the freight rates on commodities transported by steamers are the same as rail rates. At present the berthing and terminal facilities at Richmond are inadequate even for vessels of a draft that could now navigate the river. The city of Richmond proposes to deepen the part of the channel situated between the improved channel and the site of a public wharf, on which work has been begun.

The appropriation recommended will be applied to maintenance of improvement by dredging, and to enlarging the channel between Richmond, Va., and the mouth of the river by extending regulation works and dredging, for the extension of benefits.

Amount (estimated) required to be appropriated for completion of existing project	$3,082,631.58
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	75,000.00

MATTAPONI AND PAMUNKEY RIVERS, AND OCCOQUAN CREEK, VA.

(*a*) *Mattaponi River.*—The Mattaponi River rises in Virginia, flows in a southeasterly direction for about 120 miles and empties into the York River at West Point, Va. At the time of adoption of the improvement a draft of about 10 feet could be carried at low tide to Walkerton, 29 miles above West Point. Between Walkerton and Aylett, a distance of about 10 miles, there were seven bars with ruling depths varying from 2.4 to 3.8 feet. Besides these bars the river was obstructed by wrecks, logs, snags, and overhanging trees.

The original project for improvement, adopted June 14, 1880, as stated in Annual Report, Chief of Engineers, 1875, volume 2, page 166, provided for the removal of snags, wrecks, and leaning trees below Munday Bridge and the improvement of the bars below Aylett so as to give a depth of 5½ feet at low tide and a channel width of 40 feet, at an estimated cost of $34,059. This project was extended by the terms of the river and harbor act of July 13, 1892, which provided for the removal of snags as far up as Guineys Bridge, 102 miles from the mouth, near Milford Station, on the Richmond, Fredericksburg & Potomac Railroad. The estimated cost of the extended, which is the present, project is $72,100.

The work of improvement during the fiscal year consisted in rebuilding the dredge *Dalecarlia* and scows for carrying on the improvement. The work of maintenance during the fiscal year consisted in snagging and repairing floating plant.

The total expenditure was $6,599.54, of which $2,195.06 was for maintenance work.

The amount expended on the existing project to June 30, 1912, was $74,053.08, of which $35,686.10 has been applied to maintenance since March 3, 1899. Resulting from this expenditure, channels have been dredged to the full projected dimensions through 13 bars, aggregating about 4.4 miles in length (six bars having been formed since the adoption of the project) within the reach of river between Aylett and 7.4 miles therebelow, making a total of about 107,425 cubic yards of material excavated to date. Sheet pile dikes 2,297 linear feet in length have been constructed at Robinson Bar. Three wrecks, innumerable logs, snags, and overhanging trees have been removed, and the river has been kept free of such obstructions as far as Aylett. Fully 90 per cent of all the work done and expenditure made has been on the 6-mile reach immediately below Aylett.

The work on the project is now about 60 per cent completed, and has been of considerable benefit to commerce.

The maximum draft that could be carried at mean low water over the shoalest part of the channel June 30, 1912, was 4 feet. The mean range of tide is about 3.5 feet. The Mattaponi River is navigable for small steamers and vessels from its mouth to Aylett, about 39 miles above, and navigable for small lighters and rafts from Aylett to Munday Bridge, 16 miles farther.

The principal articles of commerce in the order of their relative values are general merchandise, lumber, farm produce, oysters, railroad ties, mine props, fertilizer, cordwood, canned goods, live stock, logs, pulp wood, and pickles. The receipts and shipments during 1911 amounted to 73,540 short tons and were estimated to be worth $1,073,966.

It is understood that shipments have been facilitated and that freight rates have been somewhat reduced.

The funds, $6,000, asked for for the fiscal year 1914 will be applied to redredging, snagging, and maintenance of improvement.

(*b*) *Pamunkey River.*—The Pamunkey River rises in Virginia, flows in an easterly direction about 130 miles, and empties into the York River at West Point, Va. At the time of the adoption of the project for the improvement of Pamunkey River, a draft of 7 feet could be carried at low tide to Buckland Bar, 38½ miles above its mouth. Between this bar and Bassett Ferry, a distance of 8½ miles, there were five bars, the ruling depths on which varied from 2½ to 5½ feet. Besides these bars the river was obstructed by wrecks, logs, snags, and overhanging trees.

The original, which is also the existing, project for the improvement of this river was adopted June 14, 1880, and, as modified in 1885 and 1908, contemplates securing a channel 7 feet deep and 100 feet wide between Bassett Ferry and the mouth of the river, 47 miles. This result is to be obtained by dredging and the construction of dikes, the latter being also designed to secure the dredged material deposited behind them. Wrecks, snags, logs, and trees obstructing navigation are also to be removed. The estimated cost of the revised project is $55,000, and it is estimated that the cost of maintenance will be $4,000 every four years, or an average of $1,000 annually.

Maps of the locality may be found in the Annual Reports of the Chief of Engineers for 1887, 1888, and 1890.

A report on the examination and survey of the Pamunkey River, Va., upon which the project is based, will be found in the Annual Reports of the Chief of Engineers for 1875, Part II, page 162; 1880, page 904, and 1895, page 1250, covering the river from its mouth to Hanovertown, a distance of 59 miles.

The work of improvement during the fiscal year consisted in dredging 2,280 linear feet of channel and 20,004 cubic yards of material and in the reconstruction of dredge *Delacarlia.* The work of maintenance during the fiscal year consisted in redredging parts of channel previously dredged, in snagging, and in repairing and fitting up floating plant. The total expenditure was $1,465.37, of which $3,372.04 was for maintenance work.

The amount expended on the existing project to June 30, 1912, was $50,826.26, of which $14,908.33 was applied to maintenance after March 3, 1899. This expenditure has resulted in dredging channels through all the bars to the 7-foot depth, but varying in width from 70 feet to the projected width of 100 feet, the aggregate length of these channels being about 1½ miles and the amount of excavation to date about 66,682 cubic yards; in the construction of 1,478 linear feet of sheet-pile dikes at Spring and Skidmore Bars; in the construction of 14 permeable spur dikes at Buckland and Hogan Bars, aggregating in length 2,332 linear feet; in removing eight wrecks, and in removing snags and similar obstructions from about 50 miles of river and keeping it free from such obstructions.

The work of the project is now about 80 per cent completed and has been of considerable benefit to commerce. It is understood that shipments have been facilitated.

The maximum draft that could be carried on June 30, 1912, at mean low tide over the shoalest part of the locality under improvement was 6 feet. The mean range of tide is about 3½ feet. Bassett Ferry, 47 miles above the mouth of the river, is the head of navigation for vessels drawing 7 feet, and navigation by small lighters and rafts extends about 15 miles above.

The principle articles of commerce, in the order of their relative values, are lumber, railroad ties, mine props, cordwood, pulp wood, grain, fertilizer, piles, and logs. The receipts and shipments during 1911 amounted to 52,649 short tons and were estimated to be worth $310,386.

It is understood that freight rates have been reduced.

The funds, $3,000, required for the fiscal year 1914 will be applied to maintenance of the work already done.

(*c*) *Occoquan Creek.*—Occoquan Creek rises in Virginia, flows about 50 miles in a generally southeasterly direction, and empties into the Potomac River about 28 miles below Washington, D. C. At the time of adoption of the improvement, navigation in Occoquan Creek was obstructed by three bars, over which but 1.2 feet could be carried at low tide. Aside from these obstructions, the creek was amply wide and deep at low tide for vessels drawing up to 5 feet.

The original project for improvement, adopted by river and harbor act of March 3, 1873, was in accordance with plan printed in Senate Document No. 25, Forty-second Congress, third session, and as modified in 1879 provided for dredging channels 100 feet wide and 5 feet deep through the bars below the town of Occoquan, and the construction of a dike at Sand Bar, at an estimated cost of $25,000. Four appropriations were made from 1873 to 1878, aggregating $25,000, and in 1880 the improvement was regarded as completed.

The existing project for this stream, adopted September 19, 1890, and extended by act of March 2, 1907, is in accordance with plan printed in House Document No. 75, Fifty-first Congress, first session (which contains maps), and in Annual Report of the Chief of Engineers for 1873, page 819, and contemplates the dredging of channels 6 feet deep through the five bars obstructing 6-foot navigation below the town of Occoquan, 6 miles above the mouth. These channels are to be 100 feet wide, except through the outer bar and the lower 2,000 feet of the bar next above it, where the channel is to be 150 feet wide. Dikes are to be constructed at the upper three bars. The estimated cost of the project as modified is $64,000.

The amount expended under the existing project to June 30, 1912, was $70,099.41, of which $25,672.27 was applied to maintenance subsequent to March 3, 1899. As a result of this expenditure, channels of the full projected dimensions have been dredged through all of the bars and redredged where shoaling occurred, and 2,220 linear feet of dike have been constructed at Occoquan Bar and Sand Bar and repaired where injured by freshets and ice. The aggregate amount of excavation is about 414,499 cubic yards, and dikes at Occoquan and Sand Bars have an aggregate length of 2,220 feet and contain 7,826.6 cubic yards of riprap.

All work provided for in the project has been done, except dike called for at Upper Mud Bar, the construction of which is not at present necessary. The benefits to navigation derived from this improvement are marked. Tugboats and vessels of 6-foot draft can now enter the creek on mean low tide.

The maximum draft that could be carried on June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 6 feet. The mean range of tide is about 2 feet. The town of Occoquan is the head of navigation. At Occoquan, rapids and falls begin and navigation ceases.

The principal articles of commerce in the order of their relative values are railroad ties, lumber, piles, grain, general merchandise, fish and oysters, fertilizer, cordwood, sugar, and oils.

The receipts and shipments during 1911 amounted to 32,297 short tons and were estimated to be worth $120,845.

Freight rates have been reduced.

The funds, $6,000, asked for for the fiscal year 1914, are for redredging, repairs to jetties, and maintenance of work already done.

Consolidated.

Amount (estimated) required to be appropriated for completion of existing project	$134, 870. 67
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	15, 000. 00

ONANCOCK RIVER, VA.

This stream rises in Accomac County, Va., flows west and empties into Chesapeake Bay. Its length to the town of Onancock, Va., the head of navigation, is about 5 miles.

Before improvement the channel depth was 4 feet at mean low water to the head of navigation, and 5 feet at mean low water across the bar at the mouth of the river.

Under projects adopted in 1879 and 1890 a channel 100 feet wide and 7 feet deep at mean low water was dredged through the mud flats near the wharves of Onancock, and channels 300 feet wide and 200 feet wide and 8 feet deep at mean low water were dredged through the outer and inner bars. The expenditures aggregated $20,511. The channel across the outer bar shoaled to 7 feet at mean low water; the inner bar channel has not deteriorated appreciably, but the natural channel in the river proper is narrow and tortuous, and where it was dredged there had been some shoaling.

The present project, adopted by the river and harbor act of June 25, 1910, is to dredge a channel 200 feet wide and 8 feet deep at mean low water across the outer bar, a distance of about 1,000 feet, and to straighten the river channel by cutting off projecting shoals to a depth of 7 feet at mean low water, at an estimated cost of $13,500, with annual maintenance of $1,000 after completion.

No modification of the existing project since its adoption has been made.

No work was done and no expenditures were made during the fiscal year.

The expenditures under existing project to June 30, 1912, amounted to $13,038.02.

The project has been completed.

On June 30, 1912, vessels of 7 feet draft could reach Onancock, Va., at mean low water. The rise and fall of the tide is about 2 feet.

For the calendar year 1892 the commerce was reported at 44,009 short tons, valued at $1,405,460. For the calendar year 1911 it is reported at 48,057 short tons, valued at $2,960,924.

It has not been found practicable to ascertain what effect, if any, the improvement has had upon freight rates.

The balance unexpended and the additional appropriation recommended will be applied toward maintaining the improvement.

July 1, 1911, balance unexpended	$461.98
July 1, 1912, balance unexpended	461.98
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	1,000.00

PAGAN RIVER, VA.

This stream rises in Isle of Wight County, Va., flows northeast, and empties into the James River. Its navigable length is about 12 miles.

Originally the shoals in this stream limited the draft of vessels to 6½ feet at mean low water. Under a project adopted in 1880, the sum of $10,000 was expended in dredging a channel 60 feet wide and 8 feet deep at mean low water through three shoals between the mouth and Smithfield, Va.

By the expenditure of $10,671.01, authorized in the act of March 3, 1905, a channel 40 feet wide and 10 feet deep at mean low water was made available.

The present project, adopted by the river and harbor act of June 25, 1910, provides for widening the channel at Smithfield and at a bend one-half mile below Smithfield, and for dredging off the points of abrupt bends in the existing channel farther downstream, at a cost of $4,600, with $1,000 annually for maintenance, in accordance with plan printed in House Document No. 397, Sixtieth Congress, first session.

No modification of the existing project since its adoption has been made.

To June 30, 1912, the total amount expended under the existing project was $4,600.

The project has been completed, but work of maintenance will be required.

There is now a navigable channel about 40 feet wide and 10 feet in depth at mean low water from the 10-foot contour in the James River, Va., to Smithfield, Va., a distance of about 9 miles. The head of navigation is about 3 miles above the latter point. The average range of the tide is 2.6 feet.

The commerce is handled by numerous small schooners and sloops and two regular steamers, and consists largely of peanuts and lumber.

The commerce of this stream has averaged about 100,000 short tons a year, but has varied considerably from year to year, according to whether conditions have or have not been favorable to the production of peanuts and oysters. For the calendar year 1911 it is reported to have amounted to 137,739 short tons, value not known.

It has not been found practicable to ascertain what effect, if any, the improvement has had upon freight rates. There is no rail route to points below the head of navigation.

The estimated amount required for expenditure in the fiscal year ending June 30, 1914, will be applied to maintenance of improvement, by dredging.

Amount appropriated by river and harbor act approved July 25, 1912	$1,000
Amount available for fiscal year ending June 30, 1913	1,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	1,000

RAPPAHANNOCK RIVER, VA.

Rappahannock River rises in Virginia in the Blue Ridge Mountains, flows in a general southeasterly direction, and empties into Chesapeake Bay about 40 miles above Fortress Monroe. The river is tidal from the mouth to Fredericksburg, a distance of 106 miles; 6 miles above Fredericksburg there are extensive falls, and from the falls to the source, a distance of about 100 miles, the river is not navigable on account of rapids and shoals. The lower 70 miles of the river is generally a wide and deep body of water, having the characteristics of a tidal estuary rather than of a fluvial stream.

The obstructions to navigation before improvement was undertaken consisted of 9 bars in the upper portion of the river between Tappahannock and Fredericksburg, over which the ruling depths were from 4 to 8½ feet. Seven of the bars were in the 12½ miles reach of river below Fredericksburg. Of these bars Fredericksburg Bar, with a least depth of 4 feet, and Spottswood Bar, 4 miles below Fredericksburg, with a least depth of 6 feet, caused the most delay to steamboats and vessels.

The project for this improvement was adopted March 3, 1871, in accordance with plan printed in House Document No. 60, Forty-first Congress, third session, which contains maps, and in Annual Report of the Chief of Engineers for 1906, page 110, and as modified in 1879 and 1905, forms the existing project, which provides for securing a channel 12 feet deep and 100 feet wide between Fredericksburg and Port Royal and 12 feet deep and 200 feet wide between Port Royal and the mouth of the river, this result to be obtained by dredging and the construction of dikes, the latter being also designed to secure the excavated material deposited behind them.

The total estimated cost of the revised project was $363,288.86, exclusive of work properly chargeable to maintenance and estimated in 1905 to cost $38,500. The project on which this estimate was based was adopted by Congress by act approved March 2, 1907. This act authorized an expenditure of $90,000 in excess of the amounts therein and theretofore appropriated. This makes the limit of cost of the revised project $393,633.12, including all necessary work properly chargeable to maintenance on June 30, 1907. This contract authorization of $90,000 has since been appropriated. The estimated annual cost for further maintenance is $10,000.

The work of the fiscal year consisted of redredging, protection for sand fills, the reconstruction of dredge *Dalecarlia*, and repairing floating plant. The expenditure incidental thereto, amounting to $9,295.13, was applied to maintenance.

The amount expended to June 30, 1912, was $545,967.20, of which $135,141.14 has been applied to maintenance since March 3, 1899. The sum of $59,933.18 was expended prior to March 3, 1899, in redredging freshet deposits and in repairs to dikes.

The following sums have been obtained from other sources than appropriations: Damages recovered from contractor's sureties, $1,000, and proceeds of sale of property, $135; total, $1,135, which was deposited with the funds for improving the Rappahannock River.

The expenditure has resulted in the completed improvement of the 20 bars between Fredericksburg and the mouth of the river by means of dredging and rock excavation, construction of dikes, and removal of two wrecks which obstructed navigation. About 1,297,565 cubic yards of material has been dredged, 1,537 cubic yards of rock excavated, 33,800 linear feet of dikes constructed, 8,728 linear feet of dikes repaired, 1,906 linear feet of riprap dike constructed, and 3,625 cubic yards of riprap stone used.

All work of the approved project has been completed, but it is estimated that an average annual expenditure of $10,000 will be required to keep the channels open and keep the work previously done in repair.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the locality under improvement was 10 feet. The mean range of tide is about 3 feet. Fredericksburg, 106 miles above the mouth, is the head of navigation for steamers and barges. Falmouth, 3 miles farther up, is the head of navigation for small scows, lighters, and launches.

The principal articles of commerce in the order of their relative values are general merchandise, farm produce, oysters, railroad ties, lumber, corn, flour, hay and feed, fertilizer, canned goods, live stock, fish, grain, mine props, clothing, and pulp wood. The receipts and shipments during 1911 amounted to 220,333 short tons and were estimated to be worth $6,368,098.

The work has been of benefit to commerce, and has afforded the coastwise trade access to the upper portion of the river.

It is understood that freight rates in the last few years have been increased.

At Fredericksburg Bar new deposits of sand are formed by each recurring freshet, and shoaling is also constantly taking place, though less rapidly, at some of the lower bars.

It is proposed to apply the additional appropriation recommended in removing these deposits and repairing the dikes, if needed, for the purpose of maintenance and preservation of the work already done.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$25,000

UPPER MACHODOC CREEK, VA.

Upper Machodoc Creek, rising in Virginia, is a tidal stream of a total length of about 10 miles, having few fluvial characteristics, entering the Potomac River from the south about 63 miles below Washington, D. C. In 1909 about 5½ feet of mean low water could be carried to Brickhouse Wharf over Donothon and Brickhouse Bars, and thence 4½ feet to Little Ferry Wharf over Reel Bar. From Little Ferry Wharf to Milford, 7.7 miles above the mouth, at the head of navigation, six shoals were encountered, having from 4 to 5 feet of water over them. The aggregate length of Donothon, Brickhouse, and Reel Bars is 6,570 feet, and the aggregate length of the five bars above Little Ferry Wharf was 7,400 feet.

The existing project for the improvement, adopted by the river and harbor act of June 25, 1910, provides for dredging channels 100 feet wide and 6½ feet deep from the mouth of the creek to Little Ferry Wharf, and channels 50 feet wide and 6 feet deep from Little Ferry Wharf to Milford Landing, with a turning basin of the same depth at Little Ferry and Milford Landing of sufficient size to accommodate navigation, at the estimated cost of $23,200, with an additional charge of about $1,600 annually for maintenance, in accordance with plan printed in Rivers and Harbors Committee Document No. 4, Sixty-first Congress, second session, which does not contain maps.

The report on examination and survey is contained in Rivers and Harbors Committee Document No. 4, Sixty-first Congress, second session, and covers the creek from its mouth to Milford Landing. The maps accompanying report were not printed.

No modification in the project has as yet been made.

The work of improvement during the fiscal year consisted in dredging channels 7,400 feet long and 67,063 cubic yards of excavation.

The work of maintenance during the fiscal year consisted in rebuilding dredge *Dalecarlia* and fitting up floating plant. The total expenditure was $14,303.33, of which $2,918.72 was for maintenance.

The amount expended on the existing project to June 30, 1912, was $23,200, of which $2,918.72 was applied to maintenance. As a result of this expenditure, channels aggregating about 2.65 miles in length have been dredged from the mouth to Milford through all 10 bars to the full projected dimensions. The amount of material excavated from these channels was 128,368 cubic yards.

All work of the approved project has been completed. The benefits to navigation from the improvement so far made consist of permitting the steamers to enter the creek at low tides, and giving an uninterrupted service. Formerly the steamers were barred from entering the creek by low tides.

The maximum draft that could be carried at mean low water over the shoalest part of the locality on June 30, 1912, was 7 feet between the mouth and Little Ferry Wharf, and about 6½ feet from there to Milford. The mean range of tide is about 1.8 feet. Milford is the head of navigation for steamers. Small craft can proceed about a mile farther up the creek.

The principal articles of commerce in the order of their relative values are general merchandise, railroad ties, farm produce, lumber, fertilizer, grain and seeds, live stock, manufactured iron and steel, building materials, and pulp wood. The receipts and shipments during 1911 amounted to $9,829 short tons, and were estimated to be worth $124,265.

It is not known that freight rates have been reduced.

The funds, $3,200, asked for the fiscal year 1914 will be applied to redredging and maintenance of improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement.......................... $3, 200

INLAND WATERWAY FROM NORFOLK, VA., TO BEAUFORT INLET, N. C.

This waterway is to be a part of the Boston (Mass.) to Beaufort Inlet (N. C.) section of the proposed continuous inland waterway from Boston, Mass., to the Rio Grande, and covers that portion of the route lying between Norfolk, Va., and Beaufort Inlet, N. C., a distance of 186 miles.

The approved project adopted in the river and harbor act of July 25, 1912, provides for a waterway 12 feet in depth at mean low water, at an estimated cost of $5,400,000, as described in House Document No. 391, with maps, Sixty-second Congress, second session.

Between Norfolk, Va., and Albemarle Sound the proposed route follows successively the Southern Branch of the Elizabeth River, Va., the Virginia Cut of the Albemarle and Chesapeake Canal, North Landing River, Currituck Sound, Coanjock Bay, the Carolina Cut of the Albemarle and Chesapeake Canal, and North River to Albemarle Sound, a distance of 63.5 miles.

Between Albemarle and Pamlico Sounds the proposed route follows successively the Alligator River, a proposed cut across land to Rose Bay, N. C., and Rose Bay, N. C., to Pamlico Sound, a distance of 52.7 miles. (Between Albemarle and Pamlico Sounds there exists at present a navigable waterway through Croatan Sound having a depth of about 9 feet.)

Between Pamlico Sound and Beaufort Inlet, N. C., the proposed route follows the existing waterway via Neuse River, Adams Creek, Adams Creek Canal, Core Creek, and Newport River to Beaufort, N. C., a distance of 38 miles.

The river and harbor act of July 25, 1912, appropriated $600,000 for this project, of which $500,000 is for the purchase of the canal and appurtenant property owned by the Chesapeake & Albemarle Canal Co. (See report: "Chesapeake & Albemarle Canal Co.," following this.)

During the fiscal year ending June 30, 1913, it is proposed to execute the necessary surveys, purchase the above canal, and acquire as much of the land needed for right of way in other parts of the waterway as the funds will permit.

The $800,000 recommended for appropriation during the fiscal year ending June 30, 1904, will be applied to the completion of the purchase of right of way, the purchase of a dredge, excavation by contract, and the reconstruction of bridges.

Amount appropriated by river and harbor act approved July 25, 1912	$600,000
Amount available for fiscal year 1913	600,000
Amount (estimated) required to be appropriated for completion of existing project	[1] 4,800,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 800,000

CHESAPEAKE & ALBEMARLE CANAL CO.

Letter from the Secretary of War, transmitting, pursuant to river and harbor act of June 25, 1910, copy of contract with Chesapeake & Albemarle Canal Co., for purchase of canal owned by said company. (H. Doc. No. 589, 62d Cong., 2d sess.)

War Department,
Washington, February 17, 1912.

Sir: In pursuance of a provision in the river and harbor act of June 25, 1910, I have this day entered into contract with the Chesapeake & Albemarle Canal Co., successor to the Albemarle & Chesapeake Canal Co., for the purchase and sale of the canal belonging to said company, and its appurtenances.

As directed by the law, this contract has been made subject to future ratification and appropriation by the Congress, and I have the honor to herewith transmit a copy of said contract, together with other papers explanatory of the transaction.

Very respectfully,

H. L. Stimson,
Secretary of War.

The Speaker of the House of Representatives.

War Department,
Office of the Chief of Engineers,
Washington, February 15, 1912.

The Secretary of War.

Sir: The river and harbor act of June 25, 1910, in the item relating to the inland waterway from Norfolk, Va., to Beaufort, N. C., provides, inter alia, as follows:

"The Secretary of War is hereby authorized to enter into negotiations for the purchase, as a part of said inland waterway, of the Albemarle & Chesapeake Canal or the Dismal Swamp Canal, together with all property, rights of property, and franchises appertaining thereto; and he is further authorized, if in his judgment the price is reasonable and satisfactory, to make a contract for the purchase of either of said canals and appurtenances, subject to future ratification and appropriation by Congress: *Provided*, That no contract for the purchase of either of said canals shall be made unless such purchase, after full hearing of all parties in interest, is recommended in the survey report to be hereafter submitted in compliance with the directions of Congress in the river and harbor act approved March 3, 1909."

In the survey report mentioned in the foregoing item the Board of Engineers recommended the purchase of the Albemarle & Chesapeake Canal and appurtenances for the sum of $500,000, and in submitting the report to the Secretary of War by letter of January 2, 1912, I said:

"Since all parties in interest have had full hearing and since the purchase of the Albemarle & Chesapeake Canal is recommended in this survey report, a recommendation will be promptly made by me to the Secretary of War that a contract be entered into for the purchase of the canal subject to future ratification and appropriation by Congress as provided for in the act."

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[1] Exclusive of amount available for fiscal year 1913.

Negotiations were immediately opened with the company, and I now have the honor to submit for the action of the Secretary of War articles of agreement already executed by the company and needing execution by the Secretary of War only to complete the transaction. It was the view of this office that the contract authorized by the act was not intended by Congress to be equivalent to deed of conveyance, but simply an ordinary agreement binding the company to sell, and the Government to buy, the canal and appurtenant properties; this agreement, if subsequently ratified by Congress, to be supplemented by specific deeds of conveyance in the case of landed property and by actual transfer of possession in the case of the plant and other personal property. The instrument has been drawn accordingly, the various properties being indicated or described with sufficient particularity for the purpose in view. In the accompanying letter of the district officer, dated February 5, 1912, the property is described in detail.

It will be noted that the name of the company executing the agreement is different from that designated in the act. This is due to the fact that recently this canal property was sold by decree of court and was purchased by a committee representing the bondholders of the canal, which thereupon reorganized as the Chesapeake & Albemarle Canal Co.

Attention is also invited to the fact that the property specified in the proposed agreement does not constitute all the property of the canal company. The act of Congress authorizes the Secretary of War to enter into negotiations for the purchase of the canal, " together with all property, rights of property, and of franchises appertaining thereto," and to make a contract for the purchase of said canal and appurtenances. In addition to the property named in the agreement, the company owns and claims the ownership of considerable tracts of land which the present owners of the canal hold do not appertain thereto. They propose to sell and convey a right of way through this land, but reserve to themselves a large acreage of wood and swamp land. Whether this is permissible under the terms of the act is a question of interpretation which should be given careful consideration.

It is the opinion of the district engineer officer, in which I concur, that, within the property limits of the company, the property which the company offers to convey to the United States is ample for canal purposes; and if this is held to be sufficient to meet the intent of Congress as expressed in the act I see no objection to the execution by the Secretary of War of the proposed agreement. If it should be held, however, that it was the will and expectation of Congress that the contract should cover all the property owned or claimed by the Albemarle & Chesapeake Canal Co. at the time the law was enacted, I am of the opinion that it would be best for the Secretary of War to withhold action on the agreement and transmit the papers to Congress for their further consideration of the subject. With this information it may be decided by that body to so frame legislation that will render this preliminary contract or option unnecessary.

Very respectfully,
W. H. BIXBY,
Chief of Engineers, United States Army.

The SECRETARY OF WAR.

[Second indorsement.]

WAR DEPARTMENT,
OFFICE OF THE JUDGE ADVOCATE GENERAL,
Washington, D. C., February 17, 1912.

Respectfully returned to the Secretary of War, inviting attention to the within report of the Chief of Engineers, dated February 15, 1912, for a statement of the case.

The Chief of Engineers invites attention to the fact that the draft of agreement does not include all the property owned by the canal company, and raises the question as to whether, in view of this fact, the agreement conforms to the authority conferred in the act of June 25, 1910, to enter into negotiations for the purchase of the canal, " together with all property, rights of property, and of franchises appertaining thereto," and to make a contract for the purchase of said canal and appurtenances. He states that in addition to the property named in the agreement the company owns, and claims the ownership of, considerable tracts of land which the present owners of the canal hold do not appertain thereto; that they propose to sell and convey a right of way through this land, but reserve to themselves a large acreage of wood and swamp land; and that whether this is permissible under the terms of the act is a question of interpretation which should receive careful consideration. It is stated by the local engineer officer that the width of 1,600 feet for the canal right of way which it is proposed to convey to the United States, in case Congress approves the agreement, will, in his opinion, "be ample for all canal purposes;" and that this, practically, is what the company offers to convey to the United States, so that the "sole question is whether such conveyance will be a full compliance with the intent of the law."

It is understood that the original company, in acquiring the land for the canal, purchased, along with the land needed for the purpose, considerable other timber and marsh land which was held by the company for speculation; and that it is proposed to retain such land not needed for the canal, the company insisting that it does not properly appertain to the canal.

The word "appurtenances" is one susceptible of a broad or a restricted interpretation, according to the context and the subject matter in connection with which it is used. It includes—

"Things belonging to another thing as principal and which pass as incident to the principal thing * * * and, generally, anything necessary to the enjoyment of a thing (4 Kent, 468, n.); but not an adjacent strip of land; land can not pass as appurtenant to land * * *. (Bouvier's Law Dictionary, vol. 1, 'Appurtenances'.)"

Having in view the fact that it may be assumed that it was not the intent of Congress to require the conveyance of lands which were not needed or used in connection with the proposed canal, it is believed that the language used in the said act should not be construed as requiring the conveyance of lands simply because they were owned by the canal company, where they are not needed for use in connection with the canal. In view of this fact, and also of the fact that the proposed agreement requires "future ratification and appropriation by Congress" to become binding on the United States, it is recommended that the agreement be approved and that the matter be transmitted to Congress for its action in the premises.

E. H. Crowder,
Judge Advocate General.

Norfolk, Va., *February 6, 1912.*

The Chief of Engineers, United States Army,
Washington, D. C.

Sir: In further reference to indorsement, Office of the Chief of Engineers, dated February 3, 1912, and to my letter of the 5th instant about the proposed contract for the purchase of the Albemarle & Chesapeake Canal, I desire to say that in order to get the matter in last night's mail my said letter was written very hurriedly, though I hope it made the situation reasonably plain.

A provision of the river and harbor act, 1910, authorized the Secretary of War "to enter into negotiations for the purchase * * * of the Albemarle and Chesapeake Canal * * * together with all property, rights of property, and franchises appertaining thereto," and to make a contract for the purchase of said canal "and appurtenances."

At the time this law was passed the said canal property was owned by the Albemarle & Chesapeake Canal Co. In November, 1910, this canal property was sold by decree of court, and it was purchased by a committee representing the bondholders of the canal, organized as the Chesapeake & Albemarle Canal Co.

It was my understanding of the law above quoted that it meant the acquirement by the United States of all the property, of whatever nature, belonging to the Albemarle & Chesapeake Canal Co., and which has since passed into the hands of the new Chesapeake & Albemarle Canal Co.

The correspondence is somewhat meager, but from it and from oral statements of the representatives of the old Albemarle & Chesapeake Canal Co. I received the impression that this company took the same view and contemplated selling to the United States all the property which it owned.

When the president of the new Chesapeake & Albemarle Canal Co., Mr. James M. Edwards, came to my office with his attorney yesterday it became evident at once that his view of what his company meant to sell differed radically from my view of what the law authorized the United States to contract to buy.

Mr. Edwards insisted upon an interpretation of the law much narrower than my own. He argued that the law provided for the acquirement of all property appertaining to the canal, which he interpreted as meaning all property necessary for canal purposes, and he drew a distinction between this and all property owned by the canal company. We could not agree, and hence there was nothing for me to do but to submit the question to higher authority for an authoritative interpretation of the law. The contract which I drew up and sent forward with my letter yesterday was the only one which Mr. Edwards would execute. I sent it ,executed by him, for use in case the department adopts his interpretation of the law.

The company of which Mr. Edwards is president has an undisputed title to much of the land through which the Virginia cut of the Albemarle & Chesapeake Canal passes, and he and his attorney seem confident of their ability to secure a good title to that part of this land the title to which is in dispute.

In case the United States can acquire a strip of land 1,600 feet wide along this cut it will, in my opinion, be ample for all canal purposes, and this is practically what the Chesapeake & Albemarle Co. offers to convey. The sole question is whether such a conveyance will be a full compliance with the intent of the law.

The simple fact is that this company owns and claims ownership of a considerable quantity of land besides that which it offers to sell to the United States. Some of this is marsh land, some is timbered. If this waterway passing through it is improved, the land will probably be enhanced in value, and the company desires to retain ownership of this land, probably with a view to disposing of it later.

Very respectfully,

MASON M. PATRICK,
Lieutenant Colonel, Corps of Engineers,
United States Army.

(1) These articles of agreement entered into this 17th day of February, 1912, between Henry L. Stimpson, Secretary of War, representing the United States of America, of the first part, and the Chesapeake & Albemarle Canal Co., a corporation organized under the laws of the State of Virginia, hereinafter designated as the party of the second part, witnesseth, that the said parties do hereby covenant and agree, to and with each other, as follows:

(2) This contract shall be subject to the future ratification and appropriation by the Congress of the United States.

(3) The party of the second part agrees to sell and to convey to the United States, for the sum of $500,000, the Albemarle & Chesapeake Canal, together with all property, rights of property, and franchises appertaining thereto, whether situated in the State of Virginia or in the State of North Carolina, and described as follows:

(*a*) Two canal cuts connecting the natural waterway between the Elizabeth River, in Virginia, and the Albemarle Sound, in North Carolina. The Virginia cut extends from the Elizabeth River to the North Landing River, 8¼ miles, and the right of way, 150 feet wide on each side, measured from the center of the canal, with the exception of a portion of the right of way extending through the lands of I. N. Hall, which is 100 feet wide on either side of said center line. The North Carolina cut is 2 miles long, and the right of way is 150 feet on either side of said center line, and extends from Currituck Sound to North River.

(*b*) *Houses.*—One house for collector, two houses for clerks and foreman, two houses for lock keepers, three houses for bridge keepers, one house for store, one house for office, one house for shop, three sheds, and three bridges.

(*c*) *Land.*—A tract of land containing 17 acres, more or less, at or near Great Bridge, in Norfolk County, Va.

(*d*) *Telephone line.*—A private telephone line built by the canal company from the locks to North Landing, 10 miles long.

(*e*) *Machinery, lighters, etc.*—One dredge, two lighters, tools, and office furniture.

(*f*) Wherever the canal cut passes through land owned by the party of the second part the title to which is not in dispute, the said party of the second part will convey to the party of the first part additional property which will make the total right of way through said property 1,600 feet wide.

(4) The party of the second part shall furnish to the party of the first part a full, accurate, and detailed description of all the property, rights of property, and franchises appertaining to said Albemarle & Chesapeake Canal, as set forth above, the real estate to be described by its metes and bounds and shown by

accurate maps. The corners of all tracts of real estate to be conveyed shall be properly, plainly, and permanently marked by the party of the second part. All other tangible property shall be described by the party of the second part, so that it may be readily identified.

(5) The party of the second part shall furnish an abstract of title to all the said property which it proposes to convey to the United States, the said abstract to comply with the regulations of the Department of Justice of the United States made and provided and shall be subject to examination by said Department of Justice.

(6) If the said Department of Justice is satisfied that the party of the second part can give to the United States a good and sufficient title to all of said property above described, the party of the second part shall give a proper deed vesting title to all the said real estate appertaining to the said Albemarle & Chesapeake Canal in the United States and shall convey to the United States in a legal manner all other property of whatever nature and all franchises appertaining to the said canal.

(7) After the ratification of this contract by Congress, and after the appropriation by Congress of a sufficient sum applicable thereto, and after the passing of proper instruments of title conveying the property above described, the party of the first part shall pay to the party of the second part the purchase price of $500,000.

(8) Upon the payment of the purchase price the party of the second part shall place the United States in peaceable possession of all said property, rights of property, and franchises appertaining to the said Albemarle & Chesapeake Canal.

(9) For and in consideration of said payment the party of the second part further agrees that where the canal passes through or along property to which title is claimed by the party of the second part, but which title is disputed, the party of the second part, when its title to such land is established, will convey, without further consideration, to the party of the first part additional property which will make the total right of way through said property 1,600 feet wide. The party of the second part further agrees to prosecute its claim of title to said disputed lands diligently, to the end that the same may be judicially established, and to execute and deliver, at the expense of the party of the second part, deeds for such additional property as may be conveyed to the party of the first part hereunder.

In witness whereof the parties aforesaid have hereunto placed their signatures the date first hereinbefore written.

HENRY L. STIMSON,
Secretary of War.
CHESAPEAKE & ALBEMARLE CANAL CO.,
By JAS. M. EDWARDS, *President.*

[SEAL.]
Witnesses:
HARVEY TAYLER.
JAMES E. WARE.

(Executed in quadruplicate.)

HARBOR AT BEAUFORT, N. C.

When improvement (begun in 1836) was resumed in 1881, the erosion at Fort Macon and Shackleford Points was causing serious deterioration of the inside channels and threatening deterioration of the bar channel. The governing low-water depth is said to have been 15 feet on the bar and 2 feet at Beaufort, N. C.

Newbern is 43 miles by water west from Beaufort; Southport, at the mouth of the Cape Fear River, is 120 miles to the southwest; Cape Lookout, 8 miles east.

The river and harbor act of June 25, 1910, modified the project and authorized the expenditure of $27,676 for the construction of a channel from the inland waterway between Pamlico Sound and Beaufort Inlet to the town of Beaufort, by way of Gallants Channel, in accordance with report submitted in House Document No. 511, Sixty-first Congress, second session, at an estimated cost of $27,676, with $1,500 annually for maintenance, and authorized any unexpended balance of the appropriation to be used for constructing a turning basin in front of the town of Beaufort.

The existing project provides for the maintenance of jetties and sand fences at Fort Macon and Shackleford Points; maintenance of the 7-foot channel across Bulkhead Shoal, thence to the wharves at Beaufort; repairs to existing jetties at Fort Macon Point and construction of additional jetties and shore protection; and excavation of a channel 100 feet wide and 10 feet deep at mean low water from Beaufort via Gallants Channel connecting the inland waterway between Pamlico Sound and Beaufort Inlet; also the excavation of a turning basin in front of Beaufort if funds remain available from the appropriation made June 25, 1910.

The expenditures for the year were $18,467.68, of which $4,570.47 was for maintenance, and were for building and maintaining sand fences at Shackleford Point; for extending a stone and oyster shell training wall to maintain a 7-foot channel across Bulkhead Shoal and for dredging a 10-foot channel to Beaufort.

The amount expended on present project for maintenance to June 30, 1912, was $44,457.98, and $15,831.58 for improvement under the modified project of 1910. Received from sales, etc., $726.50.

The project of 1910 is about 66 per cent completed. Length of channel dredged 9,958 linear feet, width 60 feet, depth 10 feet at mean low water.

A draft of 6 feet at mean low water can now be carried to the wharves at Beaufort, due to the action of the training wall.

The tide rises 2.5 feet at Beaufort and 3.5 feet at the inlet.

The commerce for the year 1911 amounted to 74,085 short tons, valued at approximately $2,429,229, an increase over last year of 19,885 tons.

The maintenance of this channel tends to prevent the rise in freight rates by allowing the larger vessels to reach the wharves at Beaufort.

It is proposed to expend the available balance in completing the new 10-foot channel and in maintenance, and the appropriation recommended in maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement------------------------------ $5,000

BEAUFORT INLET, N. C.

When improvement began in September, 1905, there was a minimum depth on the bar of approximately 12 feet at mean low water.

The original, which is also the existing project, adopted by Congress in the river and harbor act of March 3, 1905, is printed on page 1415 of the Annual Report of the Chief of Engineers for 1904, and in House Document No. 563, Fifty-eighth Congress, second session. It contemplates a channel 300 feet wide, 20 feet deep at mean low water, across the bar, to be obtained by dredging, at an estimated cost of $45,000. This work was accomplished at a cost of $44,484.24. Amount expended to June 30, 1912, for maintenance, $24,579.84.

The project was completed in December, 1910. The result of this work was to obtain a channel 20 feet deep at mean low water and

300 feet wide across the bar, but has since shoaled until at the end of the fiscal year a depth of about 16.5 feet is available.

No work was done during the year and no money was expended.

The commerce for the year 1911 amounted to 32,263 short tons, valued at $283,640, and consisted principally of fish, lumber, and fertilizer.

Compared with the commerce for 1910, this shows a gain of 5,163 tons.

The effect of this improvement will be to lessen freight rates by affording water transportation for products which have hitherto been dependent entirely upon railroads.

This work is designed to provide a deep-water outlet to the ocean for the inland waterway from Pamlico Sound to Beaufort Inlet, N. C.

It is proposed to expend the available balance and additional appropriation recommended in maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$10,000

HARBOR AT MOREHEAD CITY, N. C.

Situated on Bogue Sound. The city is separated from deep water in Bogue Sound by mud flats and marine marshes. Between the marshes and the city there is a shallow channel, nearly dry at low water, on which the wharves of the city are built, and which connects with deep water in the sound. The nearest city of importance is Beaufort, about 2½ miles to the eastward.

The present and only project for improvement, adopted by the river and harbor act of June 25, 1910, contemplated securing a channel, by dredging, 10 feet deep at mean low water, beginning at a point 2,000 feet westward of Beaufort Harbor, and extending up along the wharves at Morehead City for a distance of 3,800 feet, the lower 2,800 feet having a width of 100 feet and the upper 1,000 feet a width of 200 feet, at an estimated cost of $19,000, with $2,000 annually for maintenance, in accordance with plan, with map, printed in House Document No. 649, Sixty-first Congress, second session. This plan also provides for the construction, by local interests, of 500 feet of bulkhead in front of the city, behind which it is proposed to deposit part of the dredged material.

The expenditures for the year were $5,897.52, all for improvement, and were for removing under dredging contract 121,464.6 cubic yards of material from prescribed cross section, and 16,113.7 cubic yards from 1 foot outside. This work resulted in cuts 2,492 feet long and 100 feet wide and 750 feet long, 200 feet wide, and 10 feet deep at mean low water. At the close of the year the project was about 79 per cent completed.

The total expenditures to June 30, 1912, were $6,396.90, all for improvement.

As the result of the year's work, the maximum draft that could be carried to the wharves at Morehead City was 10 feet, whereas prior to the improvement only 3 feet was available.

The average range of tides is about 2.5 feet.

The commerce for the year 1911 amounted to 9,019 short tons, valued at $756,425. It consisted principally of fish, lumber, and farm products.

The available balance will be applied to completing the improvement. It is proposed to apply the additional appropriation recommended to maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement............ $2,000

BAY RIVER, N. C.

This stream is properly an arm of Pamlico Sound, emptying into same between the mouths of the Neuse and Pamlico Rivers. It is about 20 miles long, and lies in Pamlico County, flowing in a general southeasterly direction. A 10-foot channel existed originally from its mouth for a distance of 11 miles. From the head of the 10-foot channel to Bayboro, 6 miles above, the channel was obstructed by several shoals, over which about 6 to 7½ feet could be carried at ordinary stages of the water. The upper portion was partially obstructed by mud flats.

The stream is 3 miles wide at its mouth, which is unobstructed by bars. The width gradually decreases to about 80 to 100 feet at Bayboro. The town of Vandemere is 10 miles from the mouth of the river; Stonewall, 15 miles; and Bayboro, 17 miles.

The present and only project for improvement, adopted by the river and harbor act approved June 25, 1910, contemplated dredging a channel 150 feet wide and 10 feet deep at mean low water through the shoals from a point 3,500 feet below Stonewall to deep water; to widen places where the existing 10-foot channel does not equal that width to the same width, and from the above-mentioned point to Bayboro to dredge a channel 100 feet wide and 10 feet deep at mean low water, at an estimated cost of $21,000, with $1,000 annually for maintenance, in accordance with report (without maps) printed in House Document No. 583, Sixty-first Congress, second session.

There was no work done during the year. The expenditures were $6,448.27, all for improvement, and were for liabilities incurred during the previous fiscal year.

Amount expended up to June 30, 1912, all for improvement, $21,000.

The project has been about 98 per cent completed, the work having been stopped on account of lack of funds. No deterioration in the dredged channels has occurred, and 10 feet was the maximum draft that could be carried to Bayboro at mean low water on June 30, 1912.

The stream is nontidal and has but little current. Variations in the water level, due to winds, seldom exceed 1 or 2 feet higher or lower than the mean stage.

The head of navigation for all practical purposes is Bayboro, 17 miles from the mouth. Logging and rafting may be carried on for about a mile above Bayboro.

The commerce for 1911 amounted to 18,747 short tons, valued at $430,105, a decrease below that of last year of 7,017 tons. It consisted principally of fertilizers, lumber, and farm products. The result of the improvement is a slight reduction in freight rates.

The additional appropriation will be applied to maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement............ $1,000

CAPE FEAR RIVER, N. C., AT AND BELOW WILMINGTON.

Expenditures since Civil War on prior projects, $2,102,271.93.

The project adopted September 19, 1890, was to obtain a mean low-water depth of 20 feet and a width of 270 feet from Wilmington to the ocean, at an estimated cost of $1,800,000. This project was modified by act of June 13, 1902, to authorize the construction of mooring dolphins at Wilmington at a cost of $30,000, and to provide for the removal of obstructions at mouth of Brunswick River, at an estimated cost of $1,000 (see H. Doc. No. 180, 56th Cong., 2d sess.). The project was modified by the river and harbor act of March 2, 1907, which provides for continuing improvement in accordance with report submitted in House Document No. 545, Fifty-ninth Congress, first session, for completion of the 20-foot project to the projected width, by dredging and the excavation of a mooring basin in lieu of constructing mooring dolphins at Wilmington, involving a reduction in the estimate of cost to $1,392,750, including removal of obstructions at mouth of Brunswick River. The act also authorized improvement to such depth in excess of 20 feet as appropriations for the work may permit, due regard being given to the difference in tidal oscillation at the upper and lower portions of the improvement, and authorizes so much as may be necessary of the funds available to be applied to repairing the New Inlet and Swash Defense Dams. The cost of these repairs is estimated at $165,000. Annual maintenance is estimated to cost $65,000.

As the depth of this river is increased under the indefinite project, however, the annual cost of maintenance will increase.

The river and harbor act of March 2, 1907, appropriated the sum of $165,000 for improvement and authorized an additional expenditure of $250,000, all of which has since been appropriated, and the river and harbor act of March 3, 1909, provided an additional appropriation of $300,000 for this improvement.

The river and harbor act of June 25, 1910, authorized the expenditure of an additional $400,000 in securing such depth in excess of 20 feet as the appropriation may permit, and provided that if, in the judgment of the Secretary of War, the prices received in response to advertisement for bids for dredging are not reasonable and less than those at which the Government can perform the same work, so much of the amount appropriated by the said act as shall be necessary may be expended for the purchase or construction of a suitable hydraulic dredging plant for use on the Cape Fear River.

Suitable bids having been obtained, $200,000 of the above was pledged by contract.

The river and harbor act of February 27, 1911, made an appropriation of $100,000 for continuing the improvement to such depth in excess of 20 feet as appropriations made for the work will permit, and provided also that not exceeding $1,000 thereof may be used for clearing to a depth of 10 feet the channel or cut between the main channel of the river and the Carolina Beach Pier. This latter work was completed in May, 1911, which resulted in a channel 10 feet deep, 80 feet wide, and about 700 feet long.

The river and harbor act of July 25, 1912, modified the project so as to secure an available channel depth of 26 feet at mean low water and width of 300 feet, increased at entrance and curves in the river and widening to 400 feet across the bar, at an estimated cost of $572,940, with $80,000 annually for maintenance, in accordance with report printed in House Document No. 287, Sixty-second Congress, second session.

The existing project is that of 1890, modified in 1902 and 1907, by authorizing the excavation of a mooring basin at Wilmington, and the repair of New Inlet and Swash Defense Dams, again modified in 1912, to secure a channel depth of 26 feet, and width of 300 feet in the river, and width of 400 feet across the bar.

The expenditures during the year were $289,279.98, of which $75,000 was for maintenance. The work consisted of dredging under contract and with Government plant, making repairs to New Inlet Dam and its extension at Federal Point; making minor surveys and repairs to plant. The following quantities of material were removed: 661,762 cubic yards from ocean bar, 3,240,388 cubic yards from river channels, and 7,525 cubic yards from Carolina Beach cut.

As the result of the year's work, a channel 26 feet deep has been obtained across the ocean bar, varying in widths from 250 to 300 feet. In the river a channel 26 feet deep to Reaves Point and 28 feet deep on up to Wilmington was completed to a width of 150 feet, except the lower reach of Snows Marsh Channel, where the 26-foot channel is 270 feet wide, and at the Keg Island Shoal, where the width of the 28-foot channel was only 74 feet for a length of 2,000 feet. Carolina Beach cut was also restored to its former width of 80 feet and depth of 10 feet. The repairs to New Inlet Dam and Federal Point extension were completed, and this and Swash Defense Dam and their extensions are in good condition.

Expenditures.

On existing project up to June 30, 1912:	
For improvement	$2,074,271.57
For maintenance	694,957.72
Total	2,769,229.29

Received from rent, sales, etc., $36,730.02.

The average rise of the tides is 4½ feet at the ocean bar, 3½ feet at Keg Island, and 2½ feet at Wilmington.

The distance from the ocean bar to Wilmington is 30 miles, and the river is navigable 115 miles farther up to Fayetteville, the head of navigation.

The commerce of the year 1911 amounted to 1,063,908 short tons, valued at $58,933,962, an increase over last year of 119,251 tons.

The commerce consisted principally of cotton, cottonseed meal, naval stores, manufactured lumber, shingles, fertilizers, fertilizer material, coal, gum logs, crossties, and general merchandise.

As a result of the improvement, vessels coming to Wilmington are much larger than formerly, the average tonnage in 1886 being 421, while in 1911 the average was 1,259. This increase in tonnage has caused a corresponding decrease in freight rates on shipments by water.

The available balance and additional appropriation recommended will be applied to completing the improvement of the modified 1912 project and to maintaining the dredged channels.

Amount (estimated) required to be appropriated for completion of existing project	$352, 940
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	352, 940

CAPE FEAR RIVER ABOVE WILMINGTON, N. C. (LOCKS AND DAMS).

No construction work has yet been done under the existing project to affect navigation conditions. At present the extreme low-water depths are 6.2 feet to Kings Bluff, 39 miles above Wilmington; 2.5 feet to Elizabethtown, 73 miles above Wilmington; and 2 feet to Fayetteville, 115 miles above Wilmington. These depths are not subject to reference to a common plane on account of the slope of the river. The governing width of channel at the extreme low-water depths is 20 feet. Low-water stages prevailed three months during the year, and freshets which raised the water level from 15 to 50 feet at Fayetteville (the effects lower down being less marked) occurred in seven months of the year. The freshets do not occur with any regularity. Steamers made regular trips to Fayetteville eight and one-half months of the year and intermittent trips during the remainder of the year. At the close of the year the river was in good condition for navigation from Wilmington to Fayetteville.

The Cape Fear River rises in the northwestern part of North Carolina and flows in a general southeasterly direction to the Atlantic Ocean, having a length of about 400 miles. The length of the section included in this project is 115 miles from Fayetteville to Wilmington, which is 30 miles from the river's mouth.

A project for slack-water navigation on the Cape Fear River above Wilmington was adopted by the river and harbor act of June 13, 1902, and provided for the construction of three locks and dams, at a cost of $1,350,000, to afford a depth of 8 feet at mean low water. This act made an appropriation of $50,000 for the purchase of sites for locks and dams. Extensive surveys were made, the sites tentatively located and approved. Abstracts of the titles were made and turned over to the United States district attorney for examination. The titles to the land needed at the lower site were approved and the land purchased, the total expenditure being $14,682.23. The balance of this appropriation ($35,317.77) was later covered into the surplus fund, in accordance with section 10 of the sundry civil act of March 4, 1909.

The river and harbor act of June 25, 1910, adopted a new project for securing a navigable depth of 8 feet up to Fayetteville, in accordance with the report printed in House Document No. 890, Sixtieth Congress, first session, by the construction of two locks and dams, at an estimated cost of $615,000, with $8,000 annually for maintenance. An appropriation of $100,000 was made for beginning the improvement, including surveys and acquisition of land for sites for locks and dams and completion of plans for the same. The said act further provides for the completion of this project by authorizing continuing contracts in the additional sum of $515,000, $315,000 remaining to be appropriated.

The expenditures under this project to June 30, 1912, amounted to $42,032.35.

The expenditures during the year were all in connection with execution of approved project and amounted to $30,891.46. Borings were completed at Kings Bluff and Browns Landing. Shoals were surveyed below Kings Bluff. The remainder of the site required for Lock and Dam No. 2 was acquired. Foundation conditions at Kings Bluff were determined precisely by construction of shaft to a depth below the bottom of the lock foundation.

The site at Kings Bluff was cleared and grubbed. Camp buildings for use of construction force were completed and a wharf for landing supplies and materials. The construction of a telephone line from East Arcadia to Kings Bluff was partly completed.

Working plans for Lock and Dam No. 1 at Kings Bluff were completed.

The proportion of the approved project accomplished up to June 30, 1912, is estimated at 7 per cent. No results affecting navigation have been secured by work done. Fayetteville is the head of navigation, 115 miles above Wilmington.

The commerce of 1911 was estimated at 197,922 short tons, valued at $4,845,390, an increase over last year of 35,684 short tons.

The most important items of this commerce are general merchandise, fertilizer materials, and fertilizers.

The amount estimated for the year 1914 will be applied to continuing work in connection with the new project.

Amount of continuing contract authorization, act of June 25, 1910	$515,000
Amount appropriated under such authorization	200,000
Amount yet to be appropriated	315,000
Amount (estimated) required to be appropriated for completion of existing project	315,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	315,000

FISHING CREEK, N. C.

This stream rises in Warren County, N. C., and flows in a general southeasterly direction, forming for some distance the boundary line between Warren and Halifax Counties on the north and Franklin, Nash, and Edgecombe Counties on the south. It empties into Tar River about 8 miles above Tarboro. Its total length is about 120 miles (about 50 miles in an air line). Section under improvement, mouth to railroad bridge, 40 miles above.

When improvement began the stream was badly obstructed by masses of fallen timber, overhanging trees on banks, logs and snags in channel, and was navigable by rafts only a few miles above the mouth. Its depth was about 4 feet at ordinary stages to Bellamy's mill, and its width from 40 to 100 feet, and occasionally 120 feet.

The original project of 1889 was to clear the stream of logs, snags, trees, etc., up to Bellamy's mill, about 50 miles above its mouth, so as to give a minimum low-water depth of 20 inches and a minimum width of 40 feet. It was amended in 1896 to limit the work to that part below the Wilmington & Weldon Railroad bridge, about 40 miles above the mouth, and this amended project was completed in 1901, since which time work has been confined to maintenance below Beech Swamp, 18 miles above the mouth.

The sum of $22,715.10 was spent on this project, which has been finished.

The expenditures for the year were $485.81, all for maintenance. The work consisted of snagging operations by Government plant and hired labor, which resulted in clearing the channel between the mouth and Beech Swamp.

Amount expended up to June 30, 1912, for maintenance, $3,969.81.

The stream is not navigable above Beech Swamp on account of its tortuous course and rapid current. Below that point it is navigable during the higher stages about five months annually.

Between Beech Swamp and the railroad bridge the condition of the stream is unknown, but it is presumably bad.

The present head of navigation is Beech Swamp, 18 miles from its mouth, to which about 2 feet can be carried during about five months of the year, and the stream is now in fair condition to that point.

The water surface varies from a minimum depth of 6 inches at low water to 10 feet during the high freshet stages.

The commerce for 1911 amounted to 1,729 short tons, valued at $12,205, showing an increase over that for 1910 of 1,489 tons. It consisted principally of cotton seed, cottonseed meal, fertilizers, timber, etc.

The effect of the improvement on railroad and boat rates can not be definitely stated, but the stream when open to navigation affords an outlet to farm products, timber, lumber, etc., which have no other outlet except by wagons.

It is proposed to apply the additional appropriation recommended to maintenance of the natural channel by snagging.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$1,500

NEUSE AND TRENT RIVERS, N. C.

(*a*) *Neuse River.*—A tributary of Pamlico Sound, rises in the northern part of North Carolina and flows in a southeasterly direction, passing near Durham, Raleigh, and Goldsboro, until it reaches Kinston; its direction then changes to the northeast until it reaches the mouth of Contentnia Creek, when it again changes to the southeast and continues so 20 miles past Newbern, when it again changes to the northeast and continues so until it flows into Pamlico Sound at its southern extremity. Its total length is about 350 miles. The section under improvement is from 10 miles below Newbern to Smithfield, 150 miles above.

There is considerable uncertainty as to the conditions existing prior to 1878, when improvement by the Government was begun. Before the Civil War, and probably for some time afterwards, light-draft steamers made more or less regular trips as high up as Smithfield, but the low-water depth probably did not exceed 2 feet, and the stream was obstructed by snags, and after the Civil War by war blockades.

The present project, with its various modifications, provides for an 8-foot depth to Newbern at dead low water during the entire year, 4 feet to Kinston, and during nine months of the year 3 feet to

Smithfield, including a channel 300 feet wide below Newbern, 200 feet wide at Newbern, and 8 feet deep at dead low water.

The work of the year consisted of dredging and snagging by Government plant and hired labor. There were removed from Hampton Shoal 40,396 cubic yards of material and 18,666 cubic yards from Blockade Shoal, 4 miles above Newbern. The river was snagged between the tenth and fifty-ninth mileposts.

The expenditures for the year were $15,200.89, all for improvement.

Amount expended on foregoing projects to June 30, 1912:

For improvement	$347, 248. 47
For maintenance	37, 772. 41
Total	385, 020. 88

Received from sales, etc., $958.33.

The improvement above Newbern is completed to the practical limits of the existing project. The percentage of completion of the project as stated is uncertain. Below Newbern the cut through Hampton Shoal is about 15 per cent completed.

As a result of the expenditures to date the channel at and below Newbern has been partially completed to project width and depth; all war blockades have been cleared away, and the natural channel has been cleared to Smithfield, 150 miles above Newbern. No attempt has been made to maintain the stream above Waynesboro Landing (Goldsboro), 98¼ miles above Newbern. At low water 8 feet can be carried to Newbern, 4 feet to Biddles Landing, 27½ miles above, 2.5 feet to the mouth of Contentnia Creek, 31½ miles above Newbern, and 1 foot to Kinston, 50 miles above Newbern, above which point the river is only navigable on freshet stages of 2 to 3 feet.

A channel known as the Western Channel, immediately above Newbern, has been dredged to a depth of 4 feet at dead low water.

The channel of the river between Newbern and Seven Springs, near Whitehall, is in good condition.

The practical head of navigation is Maple Cypress, 25 miles above Newbern, except during freshet stages, when navigation is possible to Waynesboro Landing, about 136 miles from the mouth. There is practically no commerce above Seven Springs, 75 miles from the mouth.

The stream is nontidal. The variations of the water surface below Newbern are due entirely to the influences of the wind and vary from 3.3 feet below mean low water during severe northwest winds to 5 feet above during violent northeast gales. The upper river is subject to freshets, which rise 17 feet at Smithfield, 18 feet at Waynesboro Landing, and 20 feet at Kinston.

The commerce for the year amounted to 408,206 short tons, valued at $8,952,226, an increase of 55,035 tons over last year. It consisted of grain, timber, fertilizers, general merchandise, etc.

Freight rates are materially lessened by reason of the improvement.

The appropriation recommended will be applied to building scows, dredging through Hampton Shoal below Newbern, and snagging above Newbern.

(*b*) *Trent River.*—A tributary of Neuse River is formed by the junction of Beaver Dam and Tuckahoe Creeks, in Jones County. Its length, including the two creeks named, is about 80 miles (about 40 miles in an air line). It flows in an easterly direction through Jones County and Craven County, emptying into the Neuse River at Newbern. Section under improvement, from the mouth to upper Quaker Bridge, 78 miles. Distance from the mouth at Newbern to Polloksville, 18 miles; to lower Quaker Bridge, 27 miles; to Trenton, 38 miles. Its original condition was a channel of 6 feet depth, roughly cleared, to Polloksville, and the stream was fairly clear to lower Quaker Bridge for light-draft navigation, above which point it was badly obstructed, which prevented all navigation, except occasionally by small flatboats during high freshets.

The existing project provides for securing a channel 8 feet deep at dead low water at Newbern; maintaining a channel 50 feet wide and 4 feet deep at low water to Trenton; and securing a channel 6 feet at dead low water over Foys Flats.

The expenditures for the year were $10,409.25, of which $9,935.77 was for improvement and $473.48 for maintenance. The work consisted of dredging 15,108 cubic yards of rock between the twenty-eighth milepost and Trenton, by hired plant, which resulted in completing a channel with a minimum depth of 4 feet, but not uniformly of project width. Dredging was also carried on by Government plant and 1,274 cubic yards of material were removed from Foys Flats between the fourth and sixth mileposts, restoring the channel to the project depth of 9.3 feet at mean low water.

Amount expended on existing project up to June 30, 1912:

For improvement	$35, 753. 55
For maintenance	26, 568. 06
Total	62, 321. 61

Received from sales, etc., $835.

The improvement above Trenton has been abandoned. The project is 83 per cent completed.

Between Trenton and Newbern a 4-foot channel exists, and the stream is in fair condition, but the full project width has not yet been obtained, on account of lack of funds. Unforeseen conditions of weather and character of material increased cost so that project could not be completed within project estimate. The maximum draft at mean low water that can be carried June 30, 1912, to Polloksville, 18 miles above the mouth, is 9.3 feet; to lower Quaker Bridge, 9 miles farther, 6.5 feet; and to Trenton, 38 miles above the mouth, 4 feet.

Near the mouth the water level varies about 3 feet under normal conditions, according to the prevailing winds. Long protracted easterly or westerly winds sometimes cause a variation of 7 or 8 feet. At Trenton the stream is subject to freshets of about 5 to 15 feet during the winter months.

The head of navigation is Trenton. Above Trenton logging and rafting can be carried on a short distance. The commerce for the year 1911 amounted to 164,808.5 short tons, valued at $5,007,498, an increase of 12,496.5 tons over last year.

The commerce carried consisted principally of fertilizers, general merchandise, machinery, timber, lumber, etc.

The effect of this improvement on freight rates is not known, but it affords transportation facilities to the town of Trenton, which has no other means except by wagon.

The additional appropriation recommended will be applied to maintenance.

Consolidated.

Amount (estimated) required to be appropriated for completion of existing project	$72,500
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	12,000

NEW RIVER, N. C., INCLUDING INLAND WATERWAYS BETWEEN BEAUFORT HARBOR AND NEW RIVER AND BETWEEN NEW RIVER AND SWANSBORO.

The act of March 2, 1907, combined these three improvements under this new heading.

(*a*) *New River.*—New River lies almost wholly within Onslow County. It flows in a general southerly direction and empties into the Atlantic Ocean.

The original project of 1886 was to dredge a cut 4 feet deep and 100 feet wide through Wrights Island, and a second cut 4 feet deep and 150 feet wide through Cedar Bush Marsh. Both were completed, but the Cedar Bush Marsh cut deteriorated at the upper end and was abandoned, and the project of June 18, 1894, to obtain 4 feet depth around Cedar Bush Marsh by dredging and an experimental timber training wall was adopted and successfully carried out. The additional work required is for maintenance.

The river and harbor act of June 25, 1910, modified the project and authorized the dredging of a channel 200 feet wide and 5 feet deep at mean low water from the mouth of the river to Jacksonville at an estimated cost of $6,700, with $800 annually for maintenance after completion, in accordance with plan submitted in House Document No. 1085, Sixtieth Congress, second session.

The existing project provides for securing a channel 200 feet wide and 5 feet deep at mean low water from the mouth of the river to Jacksonville.

Amount expended since Civil War on previous projects	$33,807.82
Amount expended on project of 1910 up to June 30, 1912, for improvement	43.71
Total	33,851.53

Received from sales, $0.10.

There was no work done during the year. The expenditures, $43.71, all for improvement, were for office expenses and equipment.

The tidal range at the inlet is about 3½ feet and at the head of the marshes about 1 foot. The head of navigation for all practical purposes is Tar Landing, 8 miles above Jacksonville, 26 miles from the mouth of the river, to which a present depth of 4 feet can be carried. The depth on the bar at the mouth of the river is now 4 feet, but varies from time to time. Above Tar Landing logging and rafting can be carried on for some distance.

The commerce for 1911 amounted to 36,257 short tons, valued at $332,110.50. It consisted principally of timber, fish, fertilizer, cotton seed, and general merchandise.

In its present condition this stream probably has very little effect on freight rates in general, but it affords transportation for products which would otherwise have no means of transportation except by wagon. If the bar and channel were sufficiently improved to justify a line of steam vessels between Wilmington and Jacksonville, freight could probably be carried to the latter point much more cheaply than at present.

It is proposed to apply the existing balance to completion of the project and the appropriation recommended to maintenance. Work has not yet begun under the new project.

(*b*) *Waterway between New River and Swansboro, N. C.*—This waterway is a part of the waterway between Beaufort Harbor and New River (see pp. 1124–1127, Annual Report of the Chief of Engineers for 1889), but in 1890 two separate appropriations were made—one for the "Inland waterway between Beaufort Harbor and New River" and the other for the "Waterway between New River and Swansboro," and hence separate reports are made for the two improvements, although one embraces the other.

This waterway is about 22 miles long and originally consisted of tortuous tidal channels winding through the marine marsh, which extends from Swansboro to New River, between the mainland on the one side and the barrier beach or "banks" (which separates it from the ocean) on the other. In the vicinity of the four inlets communicating with the ocean the width of the waterway was several hundred feet and its depth from 12 to 15 feet, while between them its width diminished to about 12 feet in places and its depth to 6 inches at ordinary low water.

The original and existing project, adopted in 1889, is to enlarge the waterway by dredging to a minimum width of 40 feet and minimum depth of 3 to 4 feet at mean high water, at an estimated total cost of $43,000.

Until June 13, 1906, no work except a survey made in April and May, 1901, had ever been done on this waterway, for the reason that an act of the General Assembly of North Carolina, ratified February 13, 1889, had incorporated the Wrightsville & Onslow Navigation Co., with the exclusive right to navigate said waterway, as set forth in House Executive Document No. 26, Fifty-second Congress, first session (p. 1147 of the Annual Report of the Chief of Engineers for 1892).

On February 6, 1905, however, a paper was obtained from the two survivors of the four parties named in the charter of said Wrightsville & Onslow Navigation Co., in which paper it was declared that the privileges and franchises granted in said charter had never been exercised and that said privileges and franchises had "to all intents and purposes been surrendered and abandoned."

Amount expended on existing project up to June 30, 1912:	
For improvement	$25,688.89
For maintenance	4,800.00
Total	30,488.89

Received from rents sales, etc., $1,125.

The project is about 65 per cent completed.

The project depth exists throughout the waterway, except at places where shoaling has occurred.

The rise and fall of the tide varies from 2.2 to 4 feet in the neighborhood of the inlets to about 1 foot at the points most distant from the inlets.

The commerce of 1911 amounted to 16,958 short tons, at an approximate value of $275,805.75, an increase of 2,945 tons above that of last year. It consisted principally of cotton, fish, oysters, clams, and fertilizers.

The improvement of this waterway will probably have no direct effect upon freight rates, but if it had sufficient depth it would afford means of transportation for large quantities of timber, lumber, and miscellaneous products that now have no outlet except by wagon or by the smallest draft boats.

It is proposed to apply the available balance and the additional appropriation recommended toward completion of the project and to the maintenance of the present dredged cuts.

(*c*) *Waterway between Beaufort Harbor and New River* (*i. e., portion between Beaufort and Swansboro*).—Distance from Beaufort to Swansboro, 30 miles, with access at Swansboro to the Atlantic Ocean through Bogue Inlet.

When improvement began in 1886 the governing low-water depth was 18 inches to Swansboro.

The original project is that of 1885, to provide a channel 100 feet wide and 3 feet deep at ordinary low water between Beaufort Harbor and Swansboro, estimated to cost $6,000. This estimate was increased in 1887 to $50,000 and again increased in 1892 to $71,040.

No project was adopted originally for the part beyond Swansboro, but in 1889 a separate project for a channel 40 feet wide by 3 or 4 feet deep over this portion of the waterway was adopted, the estimated cost being $43,000. The act of 1890 made a separate appropriation of $5,000 for this portion of the route, designating it as the "Waterway between New River and Swansboro."

No modification of the original project has been made.

Amount expended on present project to June 30, 1912:	
For improvement	$60,110.73
For maintenance	2,609.54
Total	62,720.27

At the close of the fiscal year 1912 the project depth and width had been obtained through 15,315 linear feet of shoals in the first 16¼ miles of the waterway. The project depth is available through the remainder of the waterway, but the cuts are only 40 to 60 feet wide. The project is about 80 per cent completed.

Considerable shoaling has occurred at the western end of Bogue Sound, where deterioration has been greatest.

The tide at Beaufort Inlet, at the eastern end of this waterway, and at Bogue Inlet (the western end of the portion improved under appropriations for waterway between Beaufort Harbor and New River) has a range of about 3½ feet. Where the tides meet in Bogue Sound the range is only about 1 foot.

The commerce for the calendar year 1911 amounted to 55,825 short tons, valued at $956,371, an increase of 22,565 tons above that of last year. The commerce consisted chiefly of lumber, shingles, etc., fish, oysters, clams, rosin, turpentine, miscellaneous farm products, fertilizers, and general merchandise.

It is proposed to use the funds on hand and the appropriation recommended in completing the project and in maintenance.

Consolidated.

Amount (estimated) required to be appropriated for completion of existing project	$38, 798. 48
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	5, 000. 00

NORTHEAST AND BLACK RIVERS, AND CAPE FEAR RIVER ABOVE WILMINGTON, N. C.

(*a*) *Northeast River.*—A tributary of Cape Fear River rises in the northern part of Duplin County and flows in a general southerly direction, emptying into the Cape Fear River at Wilmington. Length of river, 130 miles. Section under improvement, from mouth to Kornegays Bridge, 103 miles. Distance from mouth to Bannermans Bridge, 48 miles; to Hallsville, 88 miles; to Kornegays Bridge, the head of navigation, 103 miles.

The original condition before improvement began was as follows: From the mouth, 30 miles up to Rocky Point, the river at low water was from 200 to 300 feet wide, and its channel about 60 feet wide and from 12 to 30 feet deep at high tide. In the next 30 miles the river was 100 to 150 feet wide and 6 to 30 feet deep at low tide. In the next 20 miles there was a depth of from 4.5 to 6 feet at low water. From this point to Hallsville, the river was more narrow, crooked, and shallow. At low stages, it was not navigable for shallow flats.

The original project of 1889 is still in force, and includes the clearing of the natural channel for small steamers to Hallsville, and for pole boats to Kornegays Bridge, at an estimated cost of $30,000.

Additional work proposed is for maintenance only, the project having been completed.

The expenditures for the year were $1,129.02, all for maintenance.

The work done consisted of snagging between the thirty-eighth and fifty-sixth mileposts, which restored the channel to good condition.

Amount expended on present project up to June 30, 1912:

For improvement	$10, 687. 96
For maintenance	19, 459. 39
Total	30, 147. 35

Received from rent, sales, etc., $243.33.

As a result of the expenditures to date, the channel has been cleared wherever needed. Six feet of water can be carried to Bannermans Bridge and 3 feet to Crooms Bridge during all stages of the water.

From Crooms Bridge to Kornegays Bridge, the head of navigation, the river is so shallow that navigation is practicable only when the water is up. This is liable to occur at any time, but during the summer low stages usually prevail.

The minimum low-water depth to Bannermans Bridge is 6 feet; to Crooms Bridge, 3 feet; to Hallsville, 0.5 foot; to Kornegays Bridge (the head of navigation), 0.1 foot.

There is a tidal range of about 2 feet at the mouth of this stream, which decreases to nothing at or a short distance above Bannermans Bridge. The upper portion is subject to freshets of from 8 to 12 feet.

The channel is at present badly obstructed by snags, etc., above the seventy-ninth milepost, but is in good condition below that point.

The commerce for 1911 amounted to 150,019 short tons, valued at approximately $1,887,574, an increase over last year of 29,974 tons. It consisted principally of timber, fertilizers, general merchandise, cotton, and miscellaneous farm products.

The result of the improvement on freight rates is unknown, but the stream when opened to navigation affords an outlet for farm products, timber, lumber, etc., which have no other outlet except by wagon.

The commerce is handled on a few boats that make some attempt at regular trips, and on a large number of rafts, flats, etc.

The available balance and the additional appropriation recommended will be applied to maintenance.

(*b*) *Black River.*—Black River rises in Sampson County, flows in a general southeasterly direction and empties into the Cape Fear River, 14 miles above Wilmington. Length, 175 miles. Section under improvement, mouth to Clear Run, 66 miles. The original condition when improvement began was a natural channel cleared fairly to Point Caswell and roughly to Lisbon, with governing low-water depths of 4 feet to Point Caswell, 2.5 feet to Hawes Narrows, and 1.5 feet to Lisbon.

The original project of 1885 included clearing the natural channel and banks to Lisbon, and the cutting off of a few sharp points at bends. It was amended in May, 1893, by omitting that part of the river above Clear Run, and, as amended, was completed September 20, 1895.

The existing project is that of 1894, to maintain the natural channel to Clear Run, at an estimated cost of $2,000 per annum.

The expenditures during the year amounted to $2,832.30, all for maintenance. The work consisted of snagging operations between the mouth and Clear Run and dredging through a shoal at Hawes Bluff.

Amount expended to June 30, 1912:	
On previous project mentioned above	$12,358.40
On present project, for maintenance	18,167.43
Total	30,525 83

Received from rents, sales, etc., $243.34.

The result obtained by the expenditures to date has been a cleared channel, permitting navigation to Point Caswell, 24 miles above the mouth, at all stages, and to Clear Run, 66 miles above the mouth, at stages of 1.5 feet or higher above low water, the governing low-water depths at present being 5 feet to Point Caswell, 2.5 feet to Hawes Narrows, 32 miles above the mouth, and 1.5 feet to Clear Run. There is no steamboat navigation above Clear Run. Lisbon, 74 miles from the mouth, is the head of navigation. The low-water stages prevail usually from May to August, inclusive; during the rest of the year the stage is about 5 to 8 feet higher, but the periods of high and low water are by no means the same every year. No further work, excepting maintenance, is now proposed.

The commerce during 1911 amounted to 41,332 short tons; estimated value, $850,991, a decrease from last year of 5,966 tons. It consisted principally of timber, general merchandise, naval stores, fertilizers, cotton, and other farm products.

The commerce is handled on a few boats, which make some attempt at regularity, and on a large number of rafts, flats, etc., whose trips are altogether irregular. Hence it is impossible to get the commercial statistics with even fair accuracy.

The effect of the improvement on freight rates it not known, but the stream when opened for navigation affords an outlet for freight which would have no other outlet except by wagon.

It is proposed to expend the available balance for maintenance of the natural channel up as far as Clear Run, and the appropriation recommended is for further maintenance as required.

(*c*) *Cape Fear River above Wilmington, N. C.*—The Cape Fear River is formed by the confluence at Haywood, N. C., in Chatham County, of the Deep and Haw Rivers. It flows in a southeasterly direction and empties into the Atlantic Ocean at Cape Fear, near the southern extremity of the State. Its total length is about 400 miles. The improvement of the river is divided into two parts, that section above Wilmington and that section at and below Wilmington. The portion of the section above Wilmington included in the project is from Wilmington to Fayetteville, 115 miles.

The original condition when work began was a channel badly obstructed above Kellys Cove by logs, snags, etc., and with governing low-water depths of 4 feet to Kellys Cove and 1 foot to Fayetteville.

The original project of January 26, 1881, was to clear the river to Fayetteville and obtain a continuous channel by jettying and dredging, estimated in July, 1893, to cost $275,000 for a channel 4 feet deep to Elizabethtown and 3 feet deep to Fayetteville. It is about 30 per cent completed.

This project has been abandoned, excepting for the maintenance of the natural channel, pending the construction of locks and dams, as authorized by the river and harbor act of June 25, 1910.

The expenditures for the year were $2,145.97, all for maintenance. The work consisted of snagging between thirty-eighth and seventy-second mileposts. As the result of operations the channel is free from snags between Wilmington and the thirty-ninth milepost and from the ninety-eighth milepost to Fayetteville. Between the thirty-ninth milepost and ninety-eighth milepost there are still many snags that give trouble during the low stages, or practically the same conditions exist as reported at the end of last fiscal year, on account of the numerous freshets which occurred last winter.

Amount expended on project of 1881 to June 30, 1912:	
For improvement	$134, 436. 96
For maintenance	30, 727. 37
Total	165, 164. 33

Received from sales, rents, etc., $414.33.

At present the low-water depths are 8 feet to Kings Bluff, 38 miles above Wilmington; 2½ feet to Elizabethtown, 73 miles above Wilmington; and 2 feet to Fayetteville, 115 miles above Wilmington. Fayetteville is the head of navigation. Low-water stages prevail from two or four months during each summer, and freshets, which raise the water level from 15 to 50 feet at Fayetteville (the effects lower down being less marked), usually occur as often as once a month during the rest of the year. They do not occur with any regularity, however.

The commerce of 1911 was estimated at 197,922 short tons, worth $4,845,390, an increase in the commerce over last year of 35,684 tons.

The effect of the improvement on freight rates is to reduce railroad rates to Fayetteville. To points below Fayetteville the improvement affords an outlet for freight which would have no other outlet except by wagon.

Consolidated.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$12,000

SHALLOTTE RIVER, N. C.

Following is the report of the Board of Engineers on a recent survey, printed in House Document No. 721, Sixty-second Congress, second session:

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, April 2, 1912.

Respectfully returned to the Chief of Engineers, United States Army.

From the survey of Shallotte River reported upon within, it appears that the depth across the bar is now about 7 feet, though the depth at this point is somewhat variable. Over the lower 2½ miles of river there are three shoals where the depth does not exceed 3 feet, while on the stretch of 1½ miles above, the average depth is about 3½ feet. From this point to the town of Shallotte, the stream is narrow and crooked and the channel depths vary from 2 to 12 feet. The range of tide is 5 feet at the entrance and 3½ feet at Shallotte. To procure a 6-foot channel over the upper 5 miles would require dredging over about 2 miles. Whites Landing, about a mile below the town by river, is only about 1,000 feet from the town's center in an air line. This mile of river is shallow, narrow, and crooked, and to obtain either a 4 or 6 foot channel would require dredging over almost its entire length. The district officer estimates that to dredge a channel from the mouth to Whites Landing of 6 feet depth at mean low water and 36 feet bottom width with certain cutoffs and a turning basin at Whites Landing, will cost $20,500, and that this channel can be maintained at an expense of $1,500 annually. A channel of the same width and 4 feet in depth is estimated to cost $9,845, and $1,000 annually for maintenance. No improvement above Whites Landing is recommended. He is of opinion that the 6-foot channel is justified by the present and prospective commercial interests involved, and in this view the division engineer concurs.

The commercial situation at this locality is explained in the report on preliminary examination, and summarized in the board's indorsement thereon. In recommending the survey, the board expressed the opinion that "while the commerce involved is not large and will probably never become extensive, it is believed to be sufficient under the conditions of isolation existing there to justify a moderate expenditure, provided this will secure an uninterrupted and useful navigation." In the opinion of the board the 4-foot channel will reasonably well meet existing and prospective necessities, and the expense involved is as large as would appear to be warranted. The board therefore believes that it is advisable for the United States to provide a channel from the mouth to Whites Landing, 4 feet deep at mean low water and 36 feet wide, at an estimated cost of $9,845, and $1,000 annually for maintenance. The full amount of the estimate should be provided in one appropriation.

In compliance with law, the board reports that there are no questions of water power, terminal facilities, or other related subjects which could be advantageously coordinated with the recommended improvement to lessen the cost thereof and compensate the Government for expenditures made in the interests of commerce and navigation.

The Chief of Engineers concurs in general with the above and expresses the opinion that further improvement to 6 feet depth is desirable also, provided the extra first cost be provided for by local interests.

It appears that the commerce has been slowly increasing in recent years and now amounts to 4,559 tons, valued at $211,368. The locality is entirely dependent upon water transportation, as there are no railroad facilities and the wagon haul to the nearest market is too long to be economically practicable.

SOUTH RIVER, N. C.

Following is a letter of the Acting Chief of Engineers submitting a report on a recent survey, printed in House Document No. 1095, Sixty-second Congress, third session:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, October 16, 1912.

From: The Chief of Engineers.
To: The Secretary of War.
Subject: Preliminary examination and survey of South River, N. C.

(1) There are submitted herewith, for transmission to Congress, reports dated June 22, 1911, and January 22, 1912, with map, by Capt. E. I. Brown, and Capt. H. W. Stickle, Corps of Engineers, on preliminary examination and survey, respectively, of South River, N. C. (a tributary of Pamlico River), with a view to obtaining increased depth above Aurora, called for by the river and harbor act approved February 27, 1911.

(2) Under a project adopted in the river and harbor act approved June 25, 1910, the General Government has provided a channel 7 feet deep at mean low water and 100 feet wide in South River from its mouth to Aurora, a distance of about 11 miles. The further improvement desired is the extension of this channel to the head of navigation at Idalia, about 2¼ miles farther.

(3) The district officer presents, with favorable recommendation, a plan for a channel 7 feet deep at mean low water and 100 feet wide to Royal, thence 35 feet wide to Idalia, including one cut-off, at an estimated cost of $12,686.50. The balance on hand from appropriations previously made for improvement below Aurora, of which only a small part is at present required for maintenance, is $10,604.35, so that an additional appropriation of $3,000 only would be necessary for this project if the expenditure of the balance on hand on the proposed extension were authorized. The division engineer favors improvement to such extent as can be accomplished with the funds now on hand.

(4) These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, to whose report herewith, dated March 11, 1912, attention is invited. From information furnished the board by the district officer, it appears that a channel 7 feet deep with a bottom width of 50 feet between Aurora and Royal, and of 35 feet between Royal and Idalia would cost $6,092.20, with about $500 to $800 annually for maintenance. Believing that such an improvement will adequately serve the needs of this locality for the present, the board recommends the extension of the improvement of South River under the smaller project, the work to be done with funds now available for improvement of this river between its mouth and Aurora.

(5) After due consideration of the above-mentioned reports, I concur in general with the views of the division engineer and the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the extension up to Idalia of the improvement of South River, N. C., is deemed advisable so far as to secure an available channel depth of 7 feet and width of 50 feet between Aurora and Royal and 35 feet thence to Idalia, increased on curves, following in general the methods described in the report of the district officer, at an estimated cost of $6,092.20 for first construction and $500 to $800 annually for maintenance, this extension to be accomplished with the balance remaining from previous appropriations for the lower river.

EDW. BURR,
Colonel, Corps of Engineers, Acting Chief of Engineers.

SWIFT CREEK, N. C.

A tributary of Neuse River, rises in Pitt County and flows in a southeasterly direction, almost parallel to Contentnia Creek, into Craven County, to a point about 8 miles below Vanceboro, when it turns and flows southwest for about 5 miles, emptying into the Neuse

River about 8 miles above Newbern. The section under improvement is from the mouth to Vanceboro. For 6 miles above its mouth this stream was in good condition before improvement, having an average width of 100 feet and least low-water depth of 10 feet. In the next 8 miles, to the town of Vanceboro, the least low-water depth is 6 feet and width from 50 to 150 feet, averaging about 80 feet. This upper 8 miles was rather crooked, with three bad bends, and was originally badly obstructed by logs, snags, etc., and overhanging trees. The narrowest part is the Thoroughfare, about 5 miles below Vanceboro.

The only project for improvement, adopted by the river and harbor act of June 25, 1910, contemplated securing a clear channel between the mouth of the river and Vanceboro by the removal of snags and overhanging and leaning trees, at an estimated cost of $1,600, with $500 annualy for maintenance, in accordance with plan printed in House Document No. 360, Sixty-first Congress, second session. (No maps.)

No work was done during the year, no money being available.

The expenditures to June 30, 1912, were $1,600, all for improvement.

The project has been completed and a good open channel now exists to the town of Vanceboro. Six feet is the maximum draft that can be carried to Vanceboro, which is the head of navigation, 14 miles above its mouth.

The rise of water level due to floods sometimes causes considerable currents. The maximum flood height at Vanceboro is about 12 feet.

The commerce for the year 1911 amounted to 22,458 short tons, valued at $320,635. It consisted principally of lumber, timber, fertilizers, and farm products.

The improvement has had a beneficial effect on freight rates.

The additional appropriation recommended will be applied to maintenance by snagging where needed.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$500

CHANNEL FROM CORE SOUND TO BEAUFORT HARBOR, N. C.

Beaufort Inlet having now become the actual terminus of an inland waterway connecting with northern points, and the country bordering Core Sound having greatly increased in wealth and population, the people of the community desire that their need for better and safer communication with Beaufort be considered.

The southern shore of Core Sound, stretching eastward from Beaufort for nearly 40 miles, is entirely dependent upon water transportation, Beaufort being the nearest railroad station.

It is stated that there are about 6,000 inhabitants in this section, all of whom are more or less dependent upon Beaufort and Morehead City as trading points. Their trade is carried on through about 50 local stores, which do a business of $5,000 to $10,000 each annually.

The annual commerce reported from Beaufort Harbor, most of which comes from Core Sound points, is 45,000 to 50,000 tons per annum, valued at about $2,000,000. On account of the fact that nearly every merchant, fisherman, and farmer owns and operates his own boat, it is almost impossible to obtain any accurate commercial statistics. It is known, however, that there are not less than 500 small gasoline boats operated on these waters.

The following letter of the Chief of Engineers, submitting report on a recent survey, is printed in House Document No. 546, Sixty-second Congress, second session:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, February 15, 1912.

SIR: I have the honor to submit herewith for transmission to Congress reports dated December 19, 1910, and April 28, 1911, with map, by Capt. (now Maj.) Earl I. Brown, Corps of Engineers, on preliminary examination and survey, respectively, of channel, from Core Sound to Newport River, N. C., by way of Taylors Creek or Carrot Island Slough, prepared in compliance with the river and harbor act approved June 25, 1910.

The improvement desired at this locality is a protected route from Core Sound to Beaufort and vicinity for the accommodation of small vessels engaged in general commerce which can not safely navigate the exposed channel in front of Beaufort Inlet.

The district officer presents, with favorable recommendation, a plan for such a channel 5 feet deep at mean low water and 40 feet wide on the bottom, by way of Taylors Creek, at an estimated cost of $30,000 for first construction and $2,000 annually for maintenance.

For the reasons given in his report the division engineer does not concur in this recommendation.

These reports have been referred as required by law to the Board of Engineers for Rivers and Harbors, to whose report, dated February 5, 1912, herewith, attention is invited. The board has visited the locality, held a public hearing there, and discussed the improvement with interested persons, as a result of which the locality to be benefited offers to contribute one-third of the cost of the improvement. In the opinion of the board the commercial and navigation interests involved are of sufficient magnitude to justify the United States in undertaking the proposed improvement on the basis of two-thirds of the cost being borne by the United States and the balance by the locality.

After due consideration of the above-mentioned reports I concur in general with the views of the district officer and the Board of Engineers for Rivers and Harbors, and, therefore in carrying out the instructions of Congress I report as follows: That the improvement by the United States of the channel from Core Sound to Newport River, N. C., by way of Taylors Creek is deemed advisable so far as to secure an available mean low-water depth of 5 feet and a bottom width of 40 feet, following in general the methods described in the report of the district officer, at an estimated cost of $30,000 for first construction and $2,000 annually for maintenance, provided the work shall not be undertaken until local interests have contributed the sum of $10,000 therefor, as recommended by the board. It is recommended that the initial appropriation by the United States be in the sum of $20,000, in order that the entire work of construction may be undertaken and prosecuted to an immediate completion.

Very respectfully,

W. H. BIXBY,
Chief of Engineers, United States Army.

The SECRETARY OF WAR.

WACCAMAW RIVER, N. C. AND S. C.

This stream rises in Lake Waccamaw, Columbus County, N. C., and flowing in a general southwesterly direction empties into Winyah Bay, at Georgetown, S. C. Its length is 147 miles, all of which is embraced in the project.

In 1880 this stream was navigable for 12-foot-draft boats at all stages of water from Georgetown, 23 miles, to Bull Creek, and at high water 4 miles farther, to Bucks lower mills (Bucksport); thence for 7-foot-draft boats at high water, 22 miles farther, to Conway; thence it possessed an obstructed channel for 3-foot-draft boats, at ordinary winter water, 68 miles, to Reeves Ferry; thence an obstructed channel, with 3 feet at high water, for 30 miles, to Lake Waccamaw.

The project of improvement, adopted in 1880, provides for a channel 12 feet deep at all stages of water, with 80 feet bottom width from the mouth of the river to Conway, thence a cleared channel to Lake Waccamaw.

The original estimated cost was $29,370, which was revised in 1885 and increased in the annual report of that year to the present figure, $138,400. In the Annual Report of the Chief of Engineers for 1886, page 170, maintenance is estimated at $4,000 per year after completion of improvement.

The total amount expended on the existing project up to June 30, 1912, was $196,599.97, of which $52,358.53 was for maintenance. The receipts from miscellaneous sources have been $302.50.

The proportion of the approved project accomplished to June 30, 1912, is 60 per cent. All the cut-offs required below Conway have been made and deepened to 8 feet, with width of 80 feet. There is a 12-foot channel at mean low water to Bucksport, 27 miles above the mouth; 6 feet to Conway, 50 miles; about 2 feet to Worthams Bridge, 97 miles. At high water boats of good size go to Red Bluff, 74 miles, and small boats to Reeves Ferry, 117 miles. This is the head of navigation. The usual variation in water surface is about 7.5 feet at Conway and about 12 feet at Star Bluff, 84 miles above the mouth. The tidal influence at low water extends 97 miles above the mouth.

During the calendar year 1911 the commerce carried on the river was 107,811 tons, valued at $1,621,653. The principal articles were cotton, cotton goods, timber and its products, provisions, etc. There has been little change in the nature of the commerce.

Railroad rates to and from Conway are lower on a good proportion of the articles of traffic than to and from several interior towns en route to Conway and, as the river touches points not reached by railroads, the improvement enables freight to be taken to such points.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to forming the 12-foot channel to Conway. The additional work proposed is necessary for the purpose of extension of benefits.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	$30,000

CHARLESTON HARBOR, S. C.

This harbor lies on the coast of South Carolina, about 15 miles to the south of the middle point of the coast line. It is 80 miles northeast of the mouth of the Savannah River. From the ocean bar northwest to the southern point of the city of Charleston the distance is 7½ miles; the average width of the harbor is about a mile. There were originally four channels across the bar, the deepest having about 12 feet depth at low water. Commerce was then using the Pumpkin Hill Channel, about 3 miles south of the present jetty channel. Where the present jetty channel is situated there was then the Swash Channel, with a best depth of 10½ feet of water, too crooked for safe use. The natural channels were shifting in position and variable in depth.

Under the original project two jetties were completed in 1895 at a cost of $3,432,223, the north jetty having a total length of 15,443 feet and the south jetty of 19,104 feet, the width between them at the outer ends being 2,900 feet. The jetties had been brought to a height of 12 feet above low water for the greater portion of the length.

The project adopted by the river and harbor act approved March 3, 1899, provided for obtaining a channel at the entrance to Charleston Harbor not less than 26 feet deep at mean low water (mean range of tide about 5.2 feet) and 600 feet wide, by constructing a large seagoing suction dredge, at a cost not exceeding $150,000, and operating her, together with the existing dredge *Charleston*, for three seagoing suction dredges, at a cost not exceeding $150,000, and operating it, as above, was $285,000. Of this amount $175,000 had been appropriated prior to the enactment of the river and harbor act of June 13, 1902, which made available an additional sum of $208,000, increasing to $383,000, the amount authorized for the project for the new dredge and its operation. The entire amount authorized was appropriated.

This project was completed in September, 1906. Up to June 30, 1910, $636,749.86 had been expended, including $41,943.37 for maintenance during the four years since the completion.

This project was modified by the river and harbor act of June 25, 1910, to provide for the dredging of the harbor with a view to providing an entrance channel 28 feet deep at mean low water, 1,000 feet wide beyond the jetties and 500 feet wide between them, at an estimated cost of $371,616, with annual maintenance of about $40,000.

The existing project provides for an entrance channel 28 feet deep at mean low water, 1,000 feet wide beyond the jetties, and 500 feet wide between them.

The river and harbor act approved July 25, 1912, adopted a project for completing a 20-foot-deep channel, 240 feet wide, in Ashley River, S. C., up to Standard Wharf, in accordance with plan printed in Rivers and Harbors Committee Document No. 4, Sixty-second Congress, second session, estimated to cost $51,150, which amount is provided by the act.

This act also adopted a project for improvement of Shipyard Creek in accordance with plan printed in Senate Document No. 350, Sixty-second Congress, second session, which contemplates dredging a channel 15 feet deep and 100 feet wide through the upper mouth of the creek, at an estimated cost of $5,000, which amount is provided by the act, it being understood that any dredging found necessary within the creek with a view to affording access to the wharves shall be done by local interests benefited thereby.

Dredging under the 28-foot project which began August 18, 1910, was continued during the year by the dredges *Sumter*, *Charleston*, and *Winyah Bay*. The total amount removed was 1,332,238 cubic yards, and the expenditures were $148,718.81, all of which was for new work. In addition, under the authority of the river and harbor act of March 3, 1905, authorizing the Secretary of War, in his discretion, to cause the new dredges employed on this work to be utilized, at such times as they are not employed in dredging on the outer bar, for dredging in the channels between said outer bar and the city of Charleston, 128,966 cubic yards were removed from shoals bordering the channel off the southern part of the city. The cost of this work is included in the expenditures for the 28-foot project.

The total amount expended on the existing project up to June 30, 1912, was $257,978.13, all of which was for new work. The total amount of material removed was 2,670,283 cubic yards. The receipts from miscellaneous sources have been $14,750.96.

The proportion of the approved project accomplished up to June 30, 1912, is about 75 per cent. A channel has been secured 28 feet deep at mean low water and at least 250 feet wide, a gain in depth along the central line in the past year of about 10 feet. A depth of 26 feet with a least width of 500 feet still exists in the eastern channel. There is a channel 28 feet at low water and 33 feet at high water from Charleston to the sea, a distance of 9 miles; the maximum draft that can be carried is 31 feet. The mean range of tide is about 5.2 feet.

The exports for the fiscal year 1911 amounted to 292,545 short tons, valued at $43,658,570; the imports 871,187 short tons, valued at $33,729,905, making a total of 1,163,732 tons, valued at $77,388,475. It consisted of cotton, cotton goods, fertilizer materials, provisions, general merchandise, etc. There has been no material change during the year.

The improvement has slightly influenced the rates of marine insurance; otherwise it has had no effect.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied to widening the channel to the project width of 1,000 feet. The additional work proposed is necessary for extension of benefits.

Amount (estimated) required to be appropriated for completion of existing project	[1]$71,616
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1]71,616

WINYAH BAY, S. C.

Winyah Bay lies on the coast of South Carolina, 50 miles northeast of Charleston Harbor. Its length from the ocean bar to the entrance to the city of Georgetown in a northerly direction is about 13 miles. Its breadth is small, being generally about 1½ miles, though at one place it enlarges to an area of 3 miles long and 4 miles wide. Its area is about 25 square miles.

This large bay is connected with the ocean by a passage between the shores of North and South Islands 2½ miles long, 1 mile wide at the bay, three-fourths mile wide at the gorge, and 1¼ miles wide at the ocean, or southeasterly, end of North Island. Through the passage, which trends north-northwest and south-southeast, there is a bold channel 36 feet deep at the bay, retaining a depth of not less than 20 feet until about 3,000 feet southerly from the end of North Island and of not less than 15 feet to a point about 1 mile south of the island, where the channel divides into two. One of these two channels, known as Main Channel, continues 3¼ miles farther, through extensive shoals, to the 18-foot contour in the ocean. This channel is south-southeast and in alignment with the main channel through the straits. The other, known as Bottle Channel, after flowing about

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[1] For 28-foot channel to the sea.

2,500 feet southeasterly, 1,500 feet easterly, and about 3,000 feet northeasterly, reaches the 18-foot contour in the ocean at a distance of about 1½ miles in a direction from the point of separation from the main ship channel almost at right angles with the direction of that channel and of the channel through the passage. At mean low water the depth on the crest of the bar is variable in both channels and about 7 to 9 feet in Main Channel and 6 to 8 feet in Bottle Channel. The mean range of tide is 3½ feet.

The former project, adopted in 1889, provided for the construction of two jetties springing, respectively, from North and South Islands and converging toward the bar, the jetties to consist of mattress foundation and a superstructure of large riprap stone raised to a height of 6 feet above mean low water, the south jetty to extend due east across the bar and the north jetty to converge toward it, so as to produce the necessary contraction on the bar. The depth to be secured was 15 feet at mean low water. The river and harbor act of June 3, 1896, authorized the completion of the work under the continuing-contract system, at a cost not exceeding $1,996,250, in addition to the $20,000 appropriated by the act. The entire amount has been appropriated by sundry civil acts since that date, and the jetties were completed in November, 1902. The project was extended by the river and harbor act approved June 13, 1902, to permit dredging at the shoal places in Winyah Bay, between the entrance and the city of Georgetown, S. C., over which the least channel depths might at any time be less than at the entrance to the bay, provided that the expenses of this dredging, added to that of improving the entrance to the bay, should not exceed the total amount authorized under the continuing-contract system. This 15-foot project was completed June 30, 1909.

The existing project as adopted in the river and harbor act of June 25, 1910, provides for securing a channel 18 feet deep from a point on the Sampit River 1 mile above the limits of the city of Georgetown, S. C., to the ocean entrance of Winyah Bay, following the western shore of the bay as far as may be necessary, at an estimated cost of $650,000.

The total amount expended on the former 15-foot project up to June 30, 1912, was $2,522,310.52, of which $123,958.64 was for maintenance; of this amount $8,197.28 was derived from miscellaneous sources. The total amount expended on the new 18-foot project was $151,280.74, none of which was for maintenance.

This work has been in progress under continuing-contract appropriation of $100,000, under authority of the river and harbor act of February 27, 1911, which amount was appropriated by the sundry civil act of August 24, 1912.

The proportion of the approved project accomplished up to June 30, 1912, is 30 per cent. A channel has been dredged to the depth of 18 feet along the western shore of Winyah Bay for a length of 22,670 feet. The controlling depth June 30, 1912, is 14 feet, and the maximum draft that can be carried over the shoalest part of the locality under improvement is 17 feet. The mean tidal variation is 3½ feet. The distance between the limits named in the project for the authorized channel is about 14 miles.

The amount of the commerce for the calendar year 1911 was 314,503 tons, valued at $5,322,569. It consisted mainly of lumber, timber products, cotton, provisions, and general merchandise. There has been little change in the nature of the commerce during the past year.

This improvement and the operation of ocean-going steamers and sailing vessels appear to secure to Georgetown the usual port differentials which are designed to meet water competition, this particularly on through freight from and to New York and Baltimore. The precise percentage of reduction of rates does not appear to be susceptible of determination.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to forming the 18-foot channel in front of the city of Georgetown, and in the western channel. The additional work proposed is for the purpose of extension of benefits.

Amount of continuing-contract authorization, act of Feb. 27, 1911	$100,000
Amount appropriated under such authorization	100,000
Amount (estimated) required to be appropriated for completion of existing project	250,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	65,000

GREAT PEDEE RIVER, S. C.

This river is a continuation of the stream called the Yadkin River, which rises in the mountains in the northwestern part of North Carolina, and flows in a southeasterly direction across the State. It changes its name to the Pedee (or Great Pedee) at the mouth of the Uwharie River in North Carolina, at a point 67 miles above Cheraw, S. C. Its length from this point to its mouth in Winyah Bay at Georgetown, S. C., is 234 miles, of which the portion below Cheraw, 167 miles, is embraced in the project.

The river in its original condition was dangerously obstructed by logs everywhere. Boats drawing 9 feet of water were able to reach Smiths Mills, 52 miles above the mouth. Those drawing 3½ feet could get 54 miles farther up at low water to Little Bluff, or at high water to Cheraw, 167 miles from the mouth.

The project of improvement adopted in 1880 provides for a thoroughly cleared 9-foot navigation to Smiths Mills and a 3½-foot navigation to Cheraw at all stages of water.

The original project contained no estimate of cost. From 1880 to 1886, inclusive, $47,000 was appropriated. In the Annual Report of the Chief of Engineers for 1886, page 170, it was estimated that $70,000 in addition to this $47,000 would complete the improvement, and that $5,000 a year would be required for maintenance.

A project for the improvement of the upper river (the 64 miles between Cheraw and the bridge of the Wilmington, Columbia & Augusta Railroad) was adopted in 1902. This project was in accordance with the original project and provided for obtaining, by snagging and dredging, a cleared channel, with a least depth of 3½ feet at mean low water, at a cost of $118,300. This total amount has been appropriated, and the work completed.

The total amount expended on existing project up to June 30, 1912, was $290,599.31, of which $106,886.90 was for maintenance. The receipts from miscellaneous sources have been $263.28.

As snagging will continually be required, the approved project will never be completed. The river had been cleared of snags from the mouth to the Wilmington, Columbia & Augusta Railroad bridge, 103 miles, and between that bridge and Cheraw, 167 miles, a 3½-foot channel had been formed; but, as there has been no navigation lately above mile 87, the upper portion of the river is blocked again. The usual variation in water level is 16.4 feet at Smiths Mills, 52 miles above the mouth, and 34.2 feet at Cheraw. The plane of reference is ordinary low water. About 9 feet can be carried to Smiths Mills and about 3 feet to Birches Ferry, 87 miles, the present head of navigation.

The commerce carried during the calendar year 1911 amounted to 31,396 tons, valued at $1,062,415. It consisted of cotton, fertilizers, timber and its products, provisions, etc. There was little change in the nature of the commerce during the year.

This improvement enables steamers to carry freights to points which can not be reached by rail. The rates have lately been advanced from 50 to 75 cents per bale on cotton and from $1.25 to $1.50 per ton on fertilizers owing to increased operating expenses. Package rates remain the same.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied to snagging the river wherever necessary for navigation. The additional work proposed is necessary to make improvement available.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$15,000

SANTEE, WATEREE, AND CONGAREE RIVERS, AND ESTHERVILLE-MINIM CREEK CANAL, S. C.

(*a*) *Santee River and Estherville-Minim Creek Canal.*—This river is formed by the confluence of the Congaree and Wateree Rivers, at a point 30 miles southeast of Columbia, S. C. It flows in a southeasterly direction for a distance of 143 miles and empties into the Atlantic Ocean a few miles west of the entrance to Winyah Bay. The entire length is embraced in the project.

This river in its original condition was considerably obstructed at all stages of water by sunken logs and snags. Its bar entrance was narrow, crooked, and shifting, with only about 4 feet of water at low tide, and so situated as to be difficult and expensive to improve.

The present project, adopted in 1889, contemplates providing a more satisfactory outlet into the bay by cutting a canal 70 feet wide and 6 feet deep at mean low water from the Estherville plantation to Minim Creek and for snagging the entire river. The estimated cost is $350,000, not including the amount expended under the original project.

For report on preliminary examination of river and canal see House Document No. 608, Sixty-first Congress, second session, printed without map.

The total amount expended on the existing project up to June 30, 1912, was $260,120.38, of which $75,534.84 was for maintenance. The receipts from miscellaneous sources have been $234.32.

Since continual work will be required to maintain the canal and snag the river, the approved project will never be completed. The maximum draft that can be carried is about 5 feet through the canal and 3 feet in the river. The plane of reference is for the canal and lower river mean low water, the tidal rise being 3½ feet. For the upper river the plane of reference is ordinary low water, the variation in water level being 19 feet at the Atlantic Coast Line bridge, 54½ miles above the mouth, and 20 feet at the junction of the Congaree and Wateree Rivers. The head of navigation is at this point, 143 miles above the mouth.

The commerce for the calendar year 1911 amounted to 62,293 tons, valued at $1,001,344. It consisted mainly of logs and lumber and the freight carried by the steamer line between Georgetown and Columbia, S. C. There was no material change in the commerce.

The improvement allows logs and lumber to be transported. The Santee River is a link in the waterway between Georgetown and Columbia, the effect of which is discussed under Congaree River.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to snagging the river and maintaining the canal. The additional work proposed is necessary to make the improvement available.

The existing project for Santee River makes no provision for increasing the natural depth, which is about 3 feet. A depth of 4 feet has been authorized for the Congaree River. As it is apparent that the main stream should afford facilities at least equal to those found in its tributaries, if practicable, it is recommended that a reexamination of the Santee River be authorized with a view to securing such additional depth as may be warranted by the traffic involved.

(*b*) *Wateree River.*—This river is a continuation of the stream called the Catawba River, which rises in the mountains in the western part of North Carolina and flows in a southeasterly direction across the State. It changes its name to the Wateree at the point where it is joined by the waters of Wateree Creek, in the north central part of South Carolina. It then flows in a southerly direction for 105 miles, where it unites with the Congaree River in forming the Santee River. The stretch from the mouth to Camden (67 miles) is the portion embraced in the project. In its original condition this stream had a low-water depth of from 3 to 4 feet from its mouth, 67 miles, to Camden. The lower 14 miles was completely blocked at all stages of water by logs, snags, etc., and at moderate stages by the bridges of the South Carolina and the Wilmington, Columbia & Augusta Railroads, then without draw spans; thence to Camden navigation was possible, but dangerous, except during high water. Its commerce was practically nothing.

The present project of improvement, adopted in 1881, provides for safe and unobstructed 4-foot navigation for steamers from Camden to the mouth, at an estimated cost of $60,000.

The appropriation of September 19, 1890, completed the estimate for the project, but appropriations have since been made for maintenance. The work is one of snagging and dredging, and as snags are continually lodging it is not susceptible of completion. Snagging work must be done annually in order to keep the channel open.

The total amount expended on the existing project up to June 30, 1912, was $162,885.29, of which $102,885.29 was for maintenance.

The miscellaneous receipts were $19.67.

Since continued work will be required to maintain the channel the approved project will never be completed. The expenditures have not resulted in a permanent increase in depth. The stream is not at present navigable, and it is impossible to state the maximum draft that can now be carried. The plane of reference is ordinary low water. The usual variation in water surface is about 17 feet at a point 4 miles above the mouth and about 28.5 feet at Camden, 67 miles above the mouth.

There was no business on the river during the year. The project has had no effect on freight rates.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to operating the new snag boat now under construction. The additional work proposed is necessary to make the improvement available.

(c) *Congaree River.*—This river is formed by the meeting of the Broad and Saluda Rivers, 1 mile above Columbia, S. C. It flows southeasterly about 52 miles till it unites with the Wateree River and forms the Santee River. The stretch from Columbia to the mouth, a distance of 51 miles, is embraced in the project.

In 1886 this stream in its original condition had a low water depth of 3 to 4 feet from its mouth to the railroad bridge at Columbia, thence 1 foot low water depth 2 miles farther to its head. The navigation of the lower 49 miles was blocked at all stages of water by the South Carolina Railroad bridge and by sunken logs, snags, and overhanging trees. The navigation of the remaining 2 miles, to the city of Columbia, was prevented by swift currents and numerous rock ledges and bowlders. Its commerce was nothing.

The project of improvement adopted in 1886 proposes to secure a thoroughly cleared 4-foot navigation over the lower 49 miles at all stages of water and a cleared channel through the rock ledges and bowlders above, at an estimated cost of $54,500. This project was modified in 1899, when a lock and dam was authorized for extending steamboat navigation through these ledges and bowlders in the river from Gervais Street Bridge, Columbia, to Granby. The open-channel work above Granby was thus eliminated for the time being.

Up to this date $30,673.52 had been expended. Appropriations for the lock and dam were made, amounting to $250,000, $25,000 of which, by authority of Congress, was allotted for the open-channel work. The lock and dam had been completed with the $225,000, and considerable work done in clearing the channel between the lock and the city of Columbia.

The river and harbor act of March 2, 1907, contained the following proviso in appropriating for this stream: "And the limits of the improvement of the Congaree River shall be extended to include that part of the said river included in the project from Gervais Street Bridge, Columbia, to Granby, S. C." Under this authority the work on the entire length of the river will be prosecuted under allotments from appropriations for improving Santee, Wateree, and Congaree Rivers and the Estherville-Minim Creek Canal, S. C.

In 1905 a survey of the river between the lock and dam and the mouth of the river, made to determine what additional work was required to form a 4-foot channel at all stages of water, showed that in addition to clearing the river of obstructions by snagging, dredging was also required, and that the estimated cost of the project should be increased accordingly.

This project was modified by the river and harbor act of June 25, 1910, in accordance with plan printed in House Document No. 608, Sixty-first Congress, second session, by providing the sum of $56,000, to be applied to the raising of the dam at Granby 2 feet.

The existing project provides for a thoroughly cleared 4-foot channel at all stages of water from the mouth to Gervais Street Bridge, Columbia.

The work during the year consisted in dredging and snagging to maintain a navigable steamboat channel, this being for maintenance, and in purchasing material and constructing cofferdam for the raising of the dam at the lock just below Columbia. The expenditure was $45,475.12, of which $16,630.44 was for maintenance.

The total expenditures on the existing project to June 30, 1912, were $455,069.52, of which $133,994.67 was for maintenance. The receipts from miscellaneous sources were $120.48. The expenditure of $225,000 on the lock and dam is here included in the total expenditures under this project; this is the first time it has been so reported.

Since continual work will be required to maintain the channel desired, the approved project will never be completed. During the low-water season of 1911 the depths were reduced to about 3 feet. The expenditures have not resulted in a permanent increase of depth. The usual variation in water surface at a point 2 miles above the mouth is about 24 feet and at Columbia 33 feet. The plane of reference is ordinary low water. The length of the improved section is from the mouth to Columbia, or a distance of 51 miles, with the head of navigation at present at Granby, 49 miles above the mouth.

During the calendar year 1911 the commerce amounted to 19,043.66 short tons, valued at $887,496. It consisted of logs and miscellaneous general merchandise. There has been no change in the nature of the commerce during the year.

The effect of the project has had so far no effect on the railroad freight rates, but the operating of the boat line to Georgetown, S. C., allows merchants to bring in goods from northern markets via ocean lines to Georgetown. On such shipments the saving in freight charges during the year was $14,415.24.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to dredging and snagging the channel. The additional work proposed is necessary to make the improvement available.

Consolidated.

Amount (estimated) required to be appropriated for completion of existing project	$165,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	70,000

INLAND WATERWAYS BETWEEN CHARLESTON HARBOR, S. C., AND ALLIGATOR CREEK, OPPOSITE M'CLELLANVILLE.

These waterways consist of a series of creeks, sounds, rivers, and bays, which afford a route sheltered for the most part from the sea by the numerous islands which form the outer coast line. The route is tidal throughout, the range of tide varying from about 4.6 to 5.3 feet. It is now obstructed by a number of shallow reaches and narrow, crooked passages, particularly at points where the tides meet. The passage across Bulls Bay, besides being very shallow, is much exposed. The present commerce is comparatively small, as only very small vessels can get through without excessive delays.

The plan of improvement adopted in 1902 provides for a channel between Charleston Harbor and a point opposite McClellanville 4 feet deep at mean low water and 60 feet bottom width, at an estimated cost of $125,290. The project was modified by the river and harbor act of March 2, 1907, to provide for a branch of the channel to Morrisons Landing in McClellanville. The new channel will partly follow the present channels and will partly lie in cuts across the marsh to avoid crooked and dangerous sections. It will pass to the northward of Bulls Bay. A revised estimate made during the fiscal year 1908, based upon work already done, showed that to complete the improvement there would be required $66,000 in addition to the amount originally estimated. All of this has been appropriated.

During the year a contract was awarded which will complete the project to a point opposite McClellanville and will include the branch to Morrisons Landing at McClellanville. Work under this contract was begun May 27, 1912, and 12,798 cubic yards were removed up to the close of the year; this being new work.

The total amount expended on the existing project to June 30, 1912, was $153,834.40, of which $4,264.05 was for maintenance.

The proportion of the approved project accomplished to June 30, 1912, is 84 per cent. The number of cubic yards removed has been 605,652, and the required channel has been formed except at a few localities, where work will be done under the present contract and completed during the fiscal year 1913. The maximum depth that can be carried is about 3 feet at low water, the tidal rise being about 5 feet. The length of the completed channel will be 43 miles.

The commerce through these waterways for the calendar year 1911 amounted to 44,267 short tons, valued at $924,876. It consisted of cotton and cotton products, fertilizer and other plantation supplies, vegetables, naval stores, timber, oysters, etc. No increased commerce can be expected until the channel is completed to McClellanville.

The improvement can have no effect on freight rates until it is completed.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the waterway. The additional work proposed is necessary to make the improvement available.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$25,000

BRUNSWICK HARBOR, GA.

This embraces the improved channel across the bar, St. Simons Sound, Brunswick River, East River to the upper limits of the city, and Turtle River to the Southern Railway dock; also that portion of Academy Creek used by shipping interests. The distance from the city to deep water beyond the bar is 14½ miles. The lower portion of St. Simons Sound affords an anchorage basin 6,000 feet by 3,000 feet, having a controlling depth of 30 feet at mean low water. The upper portion of the sound affords an anchorage basin 2 miles long, with a width varying from 2,000 to 3,000 feet, having a controlling depth of 24 feet at mean low water. The harbor is 111 miles by water south of Savannah Harbor, Ga., and 46 miles by water north of Fernandina Harbor, Fla.

In its original condition the ruling depth in East River was 9 feet at mean low water, and across the bar the ruling depth was variable. Prior to 1879 it appears to have been 17 feet at mean low water, and this a few years later was reduced to about 13 feet.

The original project of improvement, dated April 29, 1876, provided for the construction of a jetty at the city front and dredging, at a total cost of $69,000.

Under this project and its modifications there was expended prior to operations under the existing project the sum of $190,000.

The project in force up to June 13, 1902, was adopted by Congress in 1894. It provided for the maintenance of a navigable channel 15 feet deep at mean low water by keeping the existing works in repair and by dredging. The act of June 3, 1896, provided for the improvement of Academy Creek. The cost of maintaining a channel depth of 15 feet at mean low water was estimated at $15,000 per annum.

There had been expended under this project up to June 30, 1902, $34,817.25, all of which had been for maintenance.

Including $10,000 spent in 1836 for dredging, the total amount expended up to June 30, 1902, on the inner harbor was $234,817.25.

The act of Congress approved June 13, 1902, adopted a project providing for a navigable channel 21 feet deep at mean low water in Brunswick inner harbor, at a cost of $120,000, and for a channel across the outer bar 19.3 feet deep at mean low water (26 feet at mean high water), at a cost of $40,000. The improvement of the bar had previously been carried on by direct contract between Congress and a private individual. It also provided for dredging in Academy Creek at not to exceed $5,000. This project was completed in July, 1905, and expenditures since have been for maintenance.

The river and harbor act of March 3, 1905, authorized the expenditure from the amount therein appropriated of $5,000, or so much thereof as might be necessary, for maintaining in Academy Creek, immediately in front of and adjacent to the wharves thereof, to the Old Altamaha Canal a depth equal to the controlling depth on the shoals at the lower end of the city in East River, provided that no money should be expended inside harbor lines theretofore or thereafter established in said creek. With these funds a channel was dredged to a depth of 18.5 feet at mean low water and a width ranging from 50 to 90 feet.

The amount expended to June 30, 1907, under the project approved June 13, 1902, was $193,062, of which $19,596.82 was for maintenance. This, added to the amounts previously expended, gives a total expenditure for the work up to June 30, 1907, of $697,879.25.

The result of this expenditure was the accomplishment of a navigable channel throughout the inner harbor 21 feet deep at mean low water and of a channel across the outer bar 19.3 feet deep at mean low water; also of a narrow channel in Academy Creek, above mentioned.

A new project was adopted by the act of Congress approved March 2, 1907. This project will be found printed as House Document No. 407, Fifty-ninth Congress, first session (with map). It provides for creating and maintaining throughout the inner harbor (embracing Turtle River from the Southern Railway docks to its junction with

Brunswick River and Academy Creek from Aiken's Wharf to its junction with East River) and the outer harbor (embracing the outer bar, the navigable channel throughout the entrance to St. Simons Sound, and up Brunswick River to Brunswick Point) channels having a depth of 30 feet at mean high water, with widths varying from 150 feet in Academy Creek to 400 feet across the outer bar, to be accomplished mainly by dredging; but the extension of the existing training wall in East River and the construction of two spur dikes is also authorized. The estimated cost of the work is $496,650, with a yearly cost of maintenance not exceeding $33,250.

Congress in adopting this project appropriated the sum of $146,650 for the work and authorized contracts covering labor and materials necessary for its completion at a cost not to exceed $350,000 additional, all of which has been appropriated.

The amount expended under the present project up to June 30, 1912, was $606,554 (of which $62,550.76 was for maintenance), and resulted in securing the proposed depths and widths of channel called for by the project.

The total amount expended for the improvement of Brunswick Harbor up to June 30, 1912, was $1,304,433.25.

The removal of the refractory material in lower Turtle River completes the project for dredging as adopted by the act of Congress of March 2, 1907, the proposed widths and depths of the various channels having been once secured. As is usually the case, however, in such artificial channels, a moderate shoaling has taken place and dredging has already been necessary to restore the project dimensions. In the inner harbor shoaling has occurred in East River and also in Academy Creek. In the former locality this shoaling amounts to approximately 40,000 cubic yards, which has had the effect of diminishing the project width of the channel and has reduced the controlling depth to about 29 feet at mean high water.

The shoaling in Academy Creek has been greater in quantity, being nearly double the yardage in East River, and it has reduced the controlling depth to about 17 feet at mean low water. The depth in this creek has been unusually difficult to maintain, owing to the lack of tidal flow sufficient to cause scour. It may be necessary to consider the question of either ceasing to maintain depths in this creek, thereby forcing a movement of the wharves now established upon it, or else to devise some special works whereby the strength of the ebb-tide flow can be augmented.

Upon the crest of the bar there has also been some shoaling, which has had the effect of reducing the width of the channel for a short distance to about 200 feet. The full project depth, however, is still available. The deposit upon the bar seems to go on at a rate of about 10,700 cubic yards per month. It is interesting to note that this is almost exactly the amount that was estimated in the project adoped in 1907.

The construction of two small jetties and the extension of a third has formed a part of the project of 1907. The object of this construction was simply to reduce the cost of maintenance, and it has not yet been demonstrated that it will have that effect. It is not considered advisable to build these works until the necessity for them has been more clearly indicated.

The mean rise and fall of tide on the bar is 6.6 feet, and at Brunswick Point and at the city of Brunswick it is 7 feet.

It is proposed to apply the available balance and the additional appropriation recommended in maintaining the improvement by dredging.

Before improvement in 1880 the annual commerce of Brunswick Harbor amounted to about 100,000 short tons, valued at $1,700,000. The total commerce of the port for the calendar year 1911 amounted to 704,252 short tons of freight, valued at $44,506,731. The commerce consists principally of cotton, lumber, crossties, naval stores, and general merchandise.

The effect of the improvement has been to cause a reduction of ocean-going freight rates on lumber of 25 per cent and on naval stores of 30 per cent. It has also permitted the regular line coastwise freight steamers to enter and leave the port regardless of the tides, thereby avoiding much loss of time.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$33,250

SAVANNAH HARBOR, GA.

This covers the artificially improved channel across the Bar, the Roads, the Knoll, and the estuary of Savannah River from the mouth of the river to the upper limits of the city of Savannah. The length of this estuary is 17 miles. The distance from the upper limits of the city to deep water beyond the Bar is 26 miles, measured along the channel. The width of the channel, as defined by the regulating works, varies from about 600 feet, opposite the city, to 1,800 feet at the mouth of the river. The portion which is being improved for navigation varies from 400 to 600 feet, according to locality and curvature.

The project in force up to June 13, 1902, adopted in 1890, providing for a mean high-water depth of 26 feet from the city to the sea, is printed as part of Appendix O, Annual Report of the Chief of Engineers for 1890. The channel depth contemplated by it was reported as having been obtained at the end of the fiscal year 1896. While the project depth was literally obtained, the channel was very crooked and of much less than the project width.

From the time of the reported completion of the project of 1890, in July, 1896, until June 30, 1902, extensive dredging was done, both for maintenance and as part of the modification of the project.

On June 13, 1902, Congress adopted a project which provided for the establishment of a channel from the old waterworks (2 miles above Savannah) to the ocean, 28 feet deep at mean high water, with bottom widths of 350 to 500 feet, to be accomplished by dredging and the raising of all existing training walls between Savannah and Tybee Roads. It also provided for the construction of mooring dolphins at two points in the harbor—the "Bight" and Venus Point. The estimated cost of the work was originally $1,567,791. This amount was increased by $210,000 by the act of Congress approved March 3, 1905. This project will be found printed in House Document No. 123, Fifty-sixth Congress, second session, and also in the Annual Report of the Chief of Engineers for 1901, page 1723.

The river and harbor act of March 3, 1905, called for a resurvey of Savannah Harbor, Ga., with plans and estimates of cost, with a view to securing a channel to the sea 26 feet deep at mean low water. The survey was made and the plans and estimates prepared, and will be found printed as House Document No. 181, Fifty-ninth Congress, first session. This project was not at first adopted by Congress in its entirety, but the river and harbor act of March 2, 1907, appropriated $300,000, and in addition authorized continuing contracts in the sum of $700,000 (all of which has since been appropriated) for prosecuting the improvement and for maintenance, in accordance with the plans of the Board of Engineers for Rivers and Harbors, as set forth in the House document just referred to. The recommendation of the board was that the improvement should be undertaken in a tentative manner, with the object of first securing across the Bar the maximum depth within the limits fixed by Congress that can be maintained by dredging alone, a 21-foot channel first to be dredged and then gradually deepened until the limit fixed by economy of maintenance is reached. The act authorized such raising and extending of dikes, jetties, and other contraction works as may be necessary at a cost not to exceed $300,000, and the purchase of a pumping dredge of the stationary type at a cost of $125,000. The increased depth gained upon the Bar is to be carried up the river by dredging at such a rate as will insure the same navigable depth as is maintained on the Bar.

The project was definitely adopted by the river and harbor act of June 25, 1910, with a view to its completion by the 30th of June, 1914, at a cost of $1,545,000, exclusive of previous appropriations, this sum to be appropriated in four annual installments, the first three of $400,000 each and the last in an amount sufficient to make up the balance. This act appropriated $400,000 toward the completion of the project.

The river and harbor act approved July 25, 1912, extended the existing project in accordance with plan printed in House Document No. 563, Sixty-second Congress, second session, so as to provide for improving the Savannah River from the upper limits of the present project to the foot of Kings Island, by the excavation of a channel 21 feet in depth at mean low water, and 300 feet in width, at an estimated cost of $140,000, which amount is appropriated by the act, subject to the condition that before the work is undertaken the city of Savannah shall accept the parcel of land near the upper end of the proposed improvement previously offered by interested parties and give assurances satisfactory to the Secretary of War that the city will provide suitable terminal facilities thereat.

The amount expended under the 28-foot project (mean high water) up to June 30, 1908, was $1,643,282.29, of which $214,043.28 was for maintenance. The sum of $672.25 was derived from sales of Government property and deposited to the credit of the appropriation.

The expenditures to June 30, 1912, under the project tentatively adopted March 2, 1907, and ratified by the act of June 25, 1910, amounted to $1,702,797.17, of which $384,647.16 was for maintenance and of which $119,676.21 was disbursed on account of the construction of the dredge provided for by the project. The total amount expended for the improvement of Savannah Harbor up to June 30, 1912, was $9,369,576.82.

On June 30, 1912, the least depth in the channel, from the foot of West Broad Street, in the city of Savannah, to the sea, was only 22.5 feet at mean low water, due to a short shoal in the Long Island Crossing Channel, and at another point, in the channel along the city front, there was a least depth of 23 feet at mean low water, because the dredge has not completed its cut. Before the end of July, however, both of these shoals had been removed, so that the actual depth from Savannah to the ocean was at least 24 feet at mean low water, equivalent to 30.4 feet at mean high water. Work under the 26-foot project has not yet been carried above West Broad Street, and from this point to the upper limits of the harbor the old project depths obtain, except where they have been reduced near the Seaboard Air Line Railway bridge by the washing down of the sand from above.

The channel along the city front has the project depth of 27 feet, at mean low water, for a width of 250 feet; Wrecks Channel has the same, and between this point and Long Island Crossing the least depth is 25 feet at mean low water. At Long Island Crossing there is a least depth of 24 feet over a channel from 150 to 300 feet in width; and from Long Island Crossing to the sea the least depth is 25 feet at mean low water. On the outer bar the least depth is 25.5 feet at mean low water, but this is for a distance of only 300 feet; elsewhere the depth ranges from 26 to 28 feet, and 75 per cent of the channel area has a depth of 26 feet or over.

On June 30, 1912, 68 per cent of the work proposed had been finished, and 66.8 per cent of the total estimate of cost had been expended. This would indicate that the work remaining to be done can be accomplished within the limit allowed by law, and, indeed, it is not unlikely that at the completion of the project there may be a balance of from $50,000 to $100,000 unexpended.

It is proposed to expend the balance on hand and the additional appropriation recommended in maintaining and carrying forward, as authorized, the general project of 1905, printed as House Document No. 181, Fifty-ninth Congress, first session, and adopted by the acts of March 2, 1907, and June 25, 1910, with only such slight modifications as to the extent of dikes and retaining walls to be raised and strengthened as experience may indicate to be desirable and necessary and in carrying out, by dredging, the additional work authorized by the river and harbor act of July 25, 1912. The additional work proposed is for the completion of the project.

In 1872 the tonnage of vessels arriving and clearing at Savannah Harbor was reported to be somewhat more than 1,000,000 short tons and the total value of imports and exports about $34,000,000. In 1890 the total tonnage was reported to have increased about 2,000,000 short tons and the value of imports and exports to $152,000,000. For the calendar year 1911 the total amount of freight received and shipped at the port was 2,954,814 short tons, valued at $246,678,077. The commerce consists principally of naval stores, fertilizer, produce, iron, cotton, lumber, and general merchandise.

In the collection of commercial statistics for the calendar year 1911 information has invariably been obtained from primary sources, and collections and tabulations made by committees or boards have not been adopted. This method prevents duplication and, while it may give a result that is too small, it can not give inflated figures. For this reason the comparison of the present statistics with those collected in former years would be misleading.

The effect of the improvement upon freight rates since 1896 has been a reduction of from 30 to 50 per cent, according to the nature of the commodity.

Amount (estimated) required to be appropriated for completion of existing project	$345,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	345,000

ALTAMAHA, OCONEE, AND OCMULGEE RIVERS, GA.

These three improvements were consolidated by the river and harbor act of March 2, 1907.

(*a*) *Altamaha River, Ga.*—This river is formed by the junction of the Oconee and Ocmulgee Rivers, and flows in a southeasterly direction and empties into the Atlantic Ocean. At a point some 25 miles from its mouth the river branches, and the river traffic reaches the ocean by two routes—one by the north branch by way of Darien and the other by the south branch to where it intercepts the inside waterway, which passage is taken to Brunswick.

The river is navigable from the forks to Darien and to where it reaches the inside water route. Its length, from the mouth of the southern branch of its delta to the forks, is 144 miles. The lower section of the river is affected by the tides.

The river is subject to freshets, and in the upper sections the freshet height at times goes 20 feet above the low summer stage. The lower section is bordered by swamp lands, and the freshets rise from 5 to 10 feet over the banks.

Before improvement the Altamaha River was obstructed by rock ledges, sand bars, snags, sunken logs, and overhanging trees. The low-water depths at some points did not exceed 1 foot.

The original project of improvement submitted in 1875 contemplated a channel 4 feet deep and 80 feet wide from Macon to Darien by the removal of sand bars, rock shoals, snags, overhanging trees, etc., at a cost of $162,000.

Under it and its modifications there was expended up to June 30, 1890, $64,776.59.

The project of improvement, adopted by Congress in 1890, provides for the establishment of a channel 3 feet deep at summer low water throughout the river above Darien. This is to be accomplished by removing rock shoals and sand bars, building deflecting dikes, and closing incipient cut-offs, removing snags and sunken logs from the channel and overhanging trees from the banks of the stream, and revetting caving banks. The total estimated cost of the improvement is $129,000, provided funds are regularly and adequately supplied, besides from $3,000 to $5,000 for annual maintenance.

The river and harbor act approved July 25, 1912, adopted the recommendation contained in House Document No. 443, Sixty-second Congress, second session (with map), that these streams are worthy of further gradual improvement, following in general the methods carried on under the existing project by the expenditure of $40,000 annually on the Altamaha, Oconee, and Ocmulgee Rivers, the funds to be applied to maintenance of 3-foot depth during ordinary summer low water up to Milledgeville and Macon and to the gradual increase of channel depths so far as practicable without sacrificing the maintenance work. The act made an appropriation of $40,000 for this purpose, of which $9,000 was allotted to this stream.

The amount expended on the work under the present project up to June 30, 1912, was $132,941.48 (of which $33,371.13 was for maintenance), which, added to the amount previously expended, gives a total expenditure for this work of $197,718.07.

The proportion of the approved project of 1890 accomplished up to June 30, 1912, was about 95 per cent, referred to the old datum plane established by the survey of 1889, upon which the project is based. Referred to this datum plane, there existed throughout the Altamaha River on June 30, 1912, a least depth of 3½ feet, but the survey of this river system made in 1909–1911 showed this datum plane to be about 1 foot too high, so that, although the proposed work of improvement has actually been accomplished on this river, the original plans were not sufficient to afford the low-water depth desired and further deepening in a few localities will be necessary.

It is proposed to apply the available balance and the additional appropriation recommended in removing snags, stumps, and overhanging trees, in removing sand bars and rock shoals, protecting caving banks, and in repairing old works of improvement.

The additional work proposed is for extension of benefits.

The commerce of the river before the improvement was begun was reported to have amounted to about 100,000 short tons annually, valued at about $1,000,000. During the calendar year 1911 it amounted to 9,986 short tons, valued at $676,404. There was also rafter down the river during the same period 33,894,000 feet b. m. of timber, valued at $582,080.

As nearly as can be ascertained the effect of the improvement has been to cause a reduction of from 25 to 40 per cent in freight rates.

(*b*) *Oconee River, Ga.*—The headwaters of this river are in the northeastern part of Georgia. It flows in a southeasterly direction and unites with the Ocmulgee to form the Altamaha River. The head of navigation is Milledgeville, Ga., 145 miles from the mouth.

The river is navigable also for a distance of 17 miles between the Georgia Railroad bridge (54 miles above Milledgeville) and the northern boundary of Greene County. Between Milledgeville and the Georgia Railroad bridge, above, the river is obstructed by obstacles, both natural and artificial, and is incapable of improvement except by an expensive system of locks and dams.

In its original condition this river was used principally for navigation at high stages. At low water there were numerous shoals and snags, there being less than 2 feet on many sand bars and rock ledges.

The original project was submitted January 29, 1875, and provided for the removal of snags, overhanging trees, etc., cutting off points and making cut-offs, at a cost of $10,150.

Under this project and its modifications there was expended, previous to the commencement of operations under the existing project the sum of $44,822.18.

The project of improvement was adopted by Congress September 19, 1890. It provides for the establishment of a navigable channel 3 feet deep at ordinary summer low water from Milledgeville to the mouth. This is to be accomplished by removing rock shoals and sand bars, revetting caving banks, and closing incipient cut-offs, removing snags and logs from the channel and overhanging trees from the banks of the stream. The cost of improvement is estimated at $171,000, besides from $3,000 to $5,000 for annual maintenance. The river and harbor act of March 3, 1905, authorized the expenditure of $3,000 of the amount appropriated to be applied to cleaning out the river from the Georgia Railroad bridge to the northern boundary of Greene County, Ga., thus bringing this short section under improvement.

The river and harbor act approved July 25, 1912, adopted the recommendation contained in House Document No. 443, Sixty-second Congress, second session (with map), that these streams are worthy of further gradual improvement, following in general the methods carried on under the existing project by the expenditure of $40,000 annually on the Altamaha, Oconee, and Ocmulgee Rivers, the funds to be applied to maintenance of 3-foot depth during ordinary summer low water up to Milledgeville and Macon, and to the gradual increase of channel depths so far as practicable without sacrificing the maintenance work. The act made an appropriation of $40,000 for this purpose, of which $7,000 was allotted to this stream.

The amount expended under the present project up to June 30, 1912, was $203,213.50 (of which $31,616.76 was for maintenance), which, added to the amount previously expended, gives a total expenditure for this work of $248,035.68.

As a result of this expenditure, numerous logs, snags, stumps. bowlders, and overhanging trees have been removed, several threatened cut-offs closed and others opened, six training dikes and one spur dam and 900 feet of shore protection built, and 23 rock shoals and several sand shoals removed, all below Milledgeville. Between the Georgia Railroad bridge (54 miles above Milledgeville) and the northern boundary of Greene County, the most troublesome obstructions have been removed from the channel and numerous overhanging trees and logs cut on the banks.

The proportion of the approved project of 1890 accomplished up to June 30, 1912, was about 90 per cent, referred to the datum plane established by the survey of 1889, upon which the project was based. Referred to this datum plane, the controlling depth on June 30, 1912, from the mouth of the river to a point 94 miles above the forks, was 3 feet. From the latter point to Milledgevile the controlling depth was 2 feet, this depth existing over a stretch of about 2 miles of river just below the city. The survey of the Altamaha River system made in 1909–1911, however, showed the old datum plane to be about 1 foot too high, so that the actual controlling depths are undoubtedly less than those above given.

This river occasionally falls below the above-mentioned depths and frequently rises to 20 feet above them.

It is proposed to apply the available balance and additional appropriation recommended toward the removal of snags and stumps from the channel and the cutting of overhanging trees, the removal of rock and sand shoals, in making repairs to existing regulating works, protecting caving banks, and in closing incipient cut-offs and opening others wherever found advisable.

The additional work proposed is for extension of benefits between The Forks and Milledgeville. No additional work above Milledgeville is proposed.

No reliable statistics of the commerce of the river before the improvement was begun are available. During the calendar year 1911 the amount of freight carried on the river between The Forks and Milledgeville amounted to 6,213 short tons, valued at $266,184. There was also rafted on this portion of the river during the same period 9,110,900 feet b. m. of timber, valued at $147,628.

As nearly as can be determined, the effect of the improvement has been to cause a reduction of from 25 to 40 per cent in freight rates.

(*c*) *Ocmulgee River, Ga.*—This river has its headwaters in the northwestern part of Georgia and flows in a southeasterly direction and unites with the Oconee to form the Altamaha River. In its original condition this river was used for navigation chiefly at high stages. At low water there were numerous shoals and snags, there being less than 2 feet on many sand bars and rock ledges. The head of navigation is Macon, a distance of 205 miles from the forks.

The original project was submitted in 1875, and provided for a channel 80 feet wide and 4 feet deep at low water, to be accomplished by the removal of sand bars, rock shoals, snags, overhanging trees, etc., from Macon to Darien, at a cost of $162,000.

The amount expended under this project and its modifications prior to operations under the existing project was $79,390.73.

The project of improvement, adopted by Congress September 19, 1890, provides for the establishment of a navigable channel 3 feet deep at ordinary summer low water from Macon to the river's mouth. This is to be obtained by removing rock shoals and sand bars, closing incipient cut-offs, revetting caving banks, and removing snags and logs from the channel and overhanging trees from the banks of the stream.

The cost of the improvement as given in the project of 1890 is estimated at $210,000, provided funds are regularly and adequately appropriated, besides from $3,000 to $5,000 for annual maintenance.

The river and harbor act approved July 25, 1912, adopted the recommendation contained in House Document No. 443, Sixty-second Congress, second session (with map), that these streams are worthy of further gradual improvement, following in general the methods carried on under the existing project by the expenditure of $40,000 annually on the Altamaha, Oconee, and Ocmulgee Rivers, the funds to be applied to maintenance of 3-foot depth during ordinary summer low water up to Milledgeville and Macon, and to the gradual increase of channel depths so far as practicable without sacrificing the maintenance work. The act made an appropriation of $40,000 for this purpose, of which $20,000 was allotted to this stream.

The amount expended under the present project up to June 30, 1912, was $330,834.17 (of which $41,025.02 was for maintenance), which, added to the amount previously expended, gives a total of $410,224.90.

A total of $802.26, received from sales of unserviceable property, has been received and deposited to the credit of the appropriation.

The work under the present project has resulted in a navigable channel from the forks to Macon. A great deal of work, however, remains to be done between Macon and Hawkinsville.

The work done during the fiscal year consisted of the construction of 506 feet of bank protection, the removal of 741 snags and 32 stumps from the channel, and the cutting of 6,355 overhanging trees and 41 logs, and the girdling of 71 large trees on the banks. A 10-inch pump boat, for use on the three rivers composing the Altamaha River system, the construction of which was begun the year previous, was completed and properly equipped, and all old plant was kept in repair.

The work of bank protection and the construction of new plant was for the advancement of the project, and a part of the snagging also tended to this result. It is impossible to estimate exactly how much, but as nearly as can be determined $4,558.46 was expended for maintenance during the year, and the balance for the advancement of the project.

The proportion of the approved project of 1890 accomplished to June 30, 1912, was about 95 per cent, referred to the datum plane established by the survey of 1889, upon which the project was based. Referred to this datum plane a 3-foot depth, as provided for in the project, has been practically obtained between the forks and a point 6 miles below Macon, although, if depths be referred to the low-water establishment of the 1909–1911 survey, there is a total linear length of channel of 1.2 miles, which lacks 3 feet at a low summer stage, and including the stretch of 6 miles below Macon, there is a total linear length of 2.5 miles which lacks a 3-foot depth at a low summer stage, the controlling depth being approximately 2 feet. While it is possible to obtain a 3-foot depth through the sand shoals just below Macon by the raising of the various training walls, this improvement can not be maintained except by the removal of sand shoals by dredging. Provision for doing this has been made and the work will be undertaken in due season.

The additional work proposed is for the extension of benefits.

No reliable statistics of the commerce of the river before improvement was begun are available. In 1911 the freight carried on the river amounted to 12,251 short tons, valued at $821,413. Besides this, 11,000,000 feet b. m. of timber was rafted down the river, valued at $160,900.

As nearly as can be determined, the effect of the improvement has been to cause a reduction of from 25 to 40 per cent in freight rates.

Consolidated.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	$40,000

FLINT RIVER, GA.

Originally this river was navigable at low water from its mouth to Bainbridge, a distance of 36 miles, for boats drawing 3 feet; but the channel was narrow, crooked, and greatly obstructed by logs, snags, and overhanging trees. Above Bainbridge the channel was so obstructed by rock shoals, loose rock, and bowlders that there was no navigation except on a rise of 5 feet, when steamboats could run to Albany, 105 miles above the mouth. Above Albany to Montezuma, 182 miles from the mouth, the channel was so obstructed by sand and rock shoals, bowlders, snags, logs, and overhanging trees that the river was not navigable at a low-water stage.

This river has its source in the northern part of Georgia, flows in a general southwest direction, and its mouth is at the southwest corner of Georgia, where it unites with the Chattahoochee and forms the Apalachicola River. Its length is estimated at 360 miles. The project covers the section from the mouth to Montezuma, a distance of 182 miles.

The original project adopted June 23, 1874, called for a channel 100 feet wide and 3 feet deep at extreme low water from the mouth of the river to Albany, Ga., at an estimated cost of $184,862.

This project was extended June 14, 1880, to give a channel for light-draft steamers at moderate stages of water from Albany to Montezuma by the removal of logs, snags, and overhanging trees, cutting through rock reefs, and deepening sand bars by contraction works, at an additional cost of $15,000.

The existing project, adopted by Congress June 23, 1874, and extended June 14, 1880, provides for a channel 100 feet wide and 3 feet deep at extreme low water from the mouth of the river to Albany, Ga., at an estimated cost of $184,862, and a channel for light-draft steamers at moderate stages of the water from Albany to Montezuma by the removal of logs, snags, and overhanging trees, cutting through rock reefs, and deepening sand bars by contraction works, at an additional cost of $15,000.

There has been no modification in the existing project since adoption by Congress.

The existing project for that section from the mouth to Albany is based on report printed in Annual Report of the Chief of Engineers for 1873, page 707, and for the section between Albany and Montezuma is based on House Document No. 95, Forty-fifth Congress, third session; Annual Report of the Chief of Engineers for 1879, page 818. No maps.

Operations during the fiscal year ending June 30, 1912, consisted in drilling, blasting, and removal of rock; in snagging and in the removal of overhanging trees, at a total cost of $14,262.13, of which $4,560 was for maintenance.

The amount expended up to the close of the fiscal year ending June 30, 1912, was $333,451.24, practically all being for permanent work.

As a result of the work done, the river is now navigable throughout the year from Albany to the mouth, there being a good channel with 3 feet available at low water. The project is about 88 per cent completed.

The section between Albany and Montezuma, 77 miles, is still much obstructed, although it has been repeatedly cleared of snags and similar obstructions in accordance with the project. The ruling depth is 2.5 feet at low water.

The water level varies from 0 to 40 feet.

During ordinary low water Albany, Ga., is the head of navigation, but in periods of extreme low water, such as occurred during the fall of 1904, interruptions occur in the section between Bainbridge and Newton.

The commerce consists principally of cotton, naval stores, provisions, general merchandise, saw logs, and timber for export. Several very large sawmills are located at Bainbridge, but no record of the amount of lumber manufactured is kept, as shipments are made by rail. A large part of the saw logs used by these mills come down the river. The commerce of the lower part of this stream is so combined with that of the Chattahoochee and Apalachicola Rivers that it is impossible to give a statement in regard to it. The commerce of that part above Bainbridge was reported for 1911 as 10,448 short tons, valued at $785,159.

The effect of the improvement on freight rates, if any, can not be determined.

It is proposed to apply the available balance and the funds recommended toward making the improvement below Albany fully available by widening the channel in many places between Bainbridge and Newton, and removing many obstructions throughout the river below Albany.

This work is largely permanent rock work, and its completion will greatly benefit the section of country between Albany and the mouth of the river. There are many turpentine stills in operation on the river which depend upon the water transportation for their products and supplies.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	$15,000

SATILLA RIVER, GA.

The following is an extract from a report on a recent survey, printed in House Document No. 1113, Sixty-second Congress, third session:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, October 19, 1912.

From: The Chief of Engineers.
To: The Secretary of War.
Subject: Examination and survey of Satilla River, Ga.

1. There are submitted herewith, for transmission to Congress, reports dated October 20, 1910, and May 4, 1912, with maps, by Col. Dan C. Kingman, Corps of Engineers, on preliminary examination and survey, respectively, of Satilla River, Ga., above Burnt Fort, authorized by the river and harbor act approved June 25, 1910.

2. The improvement desired at this locality is a navigable channel up to Waycross, 114 miles above Burnt Fort and 166 miles from the mouth of the river measured along the stream. A project for improvement up to Burnt Fort, prepared under authority of the river and harbor act of March 3, 1909, and adopted by Congress in the river and harbor act approved July 25, 1912, is printed in House Document No. 41, Sixty-second Congress, first session. This river has never been improved by the United States, and the stretch under consideration is badly obstructed by leaning and overhanging trees and by sunken logs and snags, which have also induced the formation of sand and gravel bars.

3. The district officer, who is also the division engineer, presents with favorable recommendation a plan for improvement by removal of snags and overhanging trees and closure of incipient cut-offs at an estimated cost of $10,000. He states that maintenance would cost perhaps $2,000 every four years, but that experience would furnish a better guide as to the exact amount which would be required.

4. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report dated May 13, 1912. The board is of opinion, since the plan proposed would permit navigation at ordinary and high stages and would be sufficient to determine whether a more extensive improvement is necessary, that its adoption is justified at an estimated cost of $10,000, and such sum as may be necessary for

maintenance for a few years or until the advisability of modifying or discontinuing the project has been determined. The board therefore concurs in the recommendation of the district officer.

5. After due consideration of the above-mentioned reports, I concur in general with the views of the district officer and the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of Satilla River, Ga., between Burnt Fort and Waycross is deemed advisable so far as to secure the removal of obstructions and the closing of incipient cut-offs, following in general the methods described in the report of the district officer, at an estimated cost of $10,000, and such sum as may be necessary for maintenance for a few years or until the advisability of modifying or discontinuing the project has been determined. It seems desirable and advantageous that this work be prosecuted under a first appropriation of the entire estimated first cost.

H. TAYLOR,
Lieutenant Colonel, Corps of Engineers,
Acting Chief of Engineers.

SAVANNAH RIVER ABOVE AUGUSTA, GA.

The portion under consideration ends 7 miles above Augusta, where a fixed dam exists across the river at the head of rapids, which completely stops the passage of boats. Below the dam the navigation is extended into the city of Augusta by means of a canal, with locks, which was built in connection with the development of water power, but which affords no navigable connection with the river below.

From the dam, 7 miles above Augusta, to the junction of the Tugaloo and Seneca Rivers is about 106 miles. The fall is great and unequally distributed. The bottom and banks are generally of rock, and navigation, though possible for rafts and pole boats, is exceedingly difficult and dangerous. Only that portion of the river from Petersburg to the dam is at present considered worthy of improvement and has a length of 48 miles. Even in this portion of the river, in its original condition, navigation at low water was very difficult on account of the rapids, shoals, rocks, snags, and similar obstructions.

The original project of improvement, submitted February 8, 1879, provided for a 3-foot channel 30 feet wide from Augusta, Ga., to Trotters Shoals, and the removal of snags, trees, etc., to the Tugaloo River, at a cost of $45,000.

Under this project there was expended, prior to operations under the existing project, $39,000.

The existing plan of improvement, adopted by Congress July 13, 1892, provides for the establishment between Petersburg and the locks of a downstream channel 12 to 25 feet in width and navigable during ordinary summer low water for pole boats drawing 2 feet, and of an upstream channel navigable for pole boats drawing 1.3 feet of water. This is to be obtained by removing logs and overhanging trees; excavating rocks, sand, or gravel, and with excavated materials raising crests of ledges; and constructing training walls, to increase flow of water through sluices. The total estimated cost is $33,000.

The total amount expended under the present project up to June 30, 1912, was $27,949.68 (of which $1,470.94 was for maintenance), which, added to that previously expended, gives a total for this work of $66,949.68.

The work accomplished under this project has given a downstream channel about 2 feet deep and an upstream channel of the project depth. In many places, however, these channels are difficult to navigate and are capable of greater improvement.

The proportion of the approved project accomplished up to June 30, 1912, was about 64 per cent.

It is not probable that the original project will ever be carried to completion, owing to the fact that authority has been granted by Congress for the construction of two dams, for the development of water power, across this portion of the Savannah River. Plans for these water-power developments have not yet received the approval of the Chief of Engineers or been authorized by the Secretary of War, but it is highly probable that the dams will be equipped with locks and will greatly improve the navigation.

The work done during the fiscal year was for maintenance and consisted of the quarrying and placing of 311 cubic yards of rock in repairing existing regulating works and the opening up of the channel at Rapid Gap, which had been filled with sand by freshets. One large snag was also removed from the pole-boat channel.

It is proposed to apply the available balance and additional appropriation recommended in such work of maintenance as may be necessary and in such other work as may be necessary to supervise the construction of the locks and dams.

In 1876–77 about 2,000 short tons of freight went upstream and about 12,000 bales of cotton came down.

The freight carried on the river consists of cotton, hay, grain, fertilizers, cordwood, and general merchandise. There are no established lines of boats. The freight is transported in flatboats or pole boats belonging to private individuals.

During the calendar year 1911 the commerce amounted to 1,635 short tons, valued at $145,100.

The effect of the improvement has been to render navigation safer and easier, but it is impossible to determine whether it has caused any reduction in freight rates.

Amount (estimated) required to be appropriated for completion of existing project	$3,470
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	3,470

SAVANNAH RIVER BELOW AUGUSTA, GA.

This river is formed by the junction of the Tugaloo and Seneca Rivers, and flows in a southeasterly direction and empties into the Atlantic Ocean. Its sources are near the point where the three States of Georgia, South Carolina, and North Carolina come together. Continuous navigation exists over the river from Augusta to the sea, a distance of 219 miles. From Augusta to Savannah the distance is 202 miles. Below Savannah the river is regarded as a part of Savannah Harbor and is improved as such. At Augusta continuous navigation is stopped by the existence of rapids and by a dam which was erected many years ago for power purposes. Separate appropriations and a separate project have always been had for the improvement of the river above Augusta.

Previous to improvement the river was navigable for the greater part of the year for steamboats drawing from 4 to 5 feet, but during the low-water season there were various shoals in the upper portion of the river with low-water depths of not more than 2 or 3 feet. The other obstructions consisted of overhanging trees, snags, and sunken logs.

The project adopted in 1890 provides for the establishment of a navigable steamboat channel 5 feet deep at ordinary summer low water between the cities of Augusta and Savannah, to be accomplished by removing sand and gravel bars, regulating portions of the river, revetting caving banks, closing incipient cut-offs, and removing snags and logs from the channel and overhanging trees from the banks of the stream.

The total estimated cost of this improvement, in round numbers, was $332,000, on the supposition that funds would be regularly and adequately supplied, besides $3,000 to $5,000 annually for maintenance.

The river and harbor act of March 2, 1907, called for a survey of the Savannah River for 30 miles below Augusta, Ga., where all of the serious obstructions to navigation were to be found. Report on this survey is printed as House Document No. 962, Sixtieth Congress, first session. It provides a project for the improvement of the entire river, not differing from the project of 1890 in the results to be obtained, but differing in methods of improvement and estimates of cost, particularly for the portion of the river covered by the survey. The total estimated cost of the improvement is $360,000, with an annual cost of maintenance of $10,000 until all of the proposed work has been completed, after which it may be possible to reduce the amount to $4,000 or $5,000 a year. This project was adopted by the river and harbor act of June 25, 1910, and Congress declares its intention to complete the work in four years.

The amount expended upon the work under the project of 1890 up to June 30, 1912, was $542,555.55 (of which $112,247.74 was for maintenance), which, added to the amount previously expended, gives a total expenditure for this work of $636,035.64.

The work done under the project of 1890 freed the river from snags, stumps, and overhanging trees, although others appear from time to time; shoals and sand bars were removed from a number of localities by training dikes, and the banks were protected in a number of caving bends. A great deal of work still remains to be done, particularly in the upper portion of the river, where the natural conditions are most unstable and where the concave banks must all be protected and where the detritus brought down from the torrential portion of the river above forms shoals after every freshet, which regulating works can never wholly control and which must be periodically removed by dredging.

As the result of the survey of 1907 a project was prepared which comprised a certain specified number of things to be done for the improvement of the river and gave an estimate of their cost.. Of the things therein specified 25 per cent have been completed, and the improvements heretofore made have been well maintained.

At the close of the fiscal year the river throughout the portion under improvement was probably freer from snags than it has ever been before. At the end of the year, on account of the high stage of the river, the depth and width of the channel was far in excess of project requirements. The actual depths on certain of the bars was much less than project requirements, but, as is always the case in alluvial rivers, the bars will cut out as the river falls. At most of the places where the regulating works have been completed the project depth will probably be had. At such other points it will be gained as rapidly as possible by the use of the suction dredge.

It is proposed to apply the available balance and additional appropriation recommended toward the completion of the new project adopted by act of Congress of June 25, 1910, and to keeping the channel cleared of bars and snags and similar obstructions, and to maintain the existing regulating works.

The work proposed is for the completion of the adopted project.

Prior to the improvement the commerce was small, but its quantity unknown. The total commerce of the river during the calendar year 1911 amounted to 40,168 short tons, valued at $5,628,083. It consists principally of cotton and cotton-factory products, naval stores, fertilizers, and general merchandise. There was also rafted down the river during 1911 about 25,000,000 feet b. m. of timber, valued at about $250,000.

The effect of the improvement upon freight rates has been a reduction of from 30 to 50 per cent, according to the nature of the commodity.

The act of Congress approved June 25, 1910, requires this work to be completed in four years, and the amount estimated for the year 1914 is the amount which should be appropriated in order to permit of compliance with the law.

Amount (estimated) required to be appropriated for completion of existing project	$115,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	125,000

CHATTAHOOCHE RIVER, GA. AND ALA., BELOW COLUMBUS.

Columbus, Ga., is 223 miles above the junction of this river with the Flint River and 360 miles above the mouth of the Apalachicola River, which is formed by the confluence of the Chattahoochee and Flint. Originally boats drawing 22 inches were able to reach Columbus for about nine months each year, but navigation was difficult and dangerous by day and impossible by night, owing to the large accumulation of logs, snags, and overhanging trees, and to sand, rock, and marl shoals obstructing the channel.

The source of this river is in the northern part of the State of Georgia, and its mouth at junction with the Flint River is at the southwest corner of Georgia. Its length is approximately 400 miles. Its general direction of flow is southerly. The length of the section included in the project is that from the mouth to Columbus, Ga.

The original and existing project for the improvement, adopted June 23, 1874, provided for a low-water channel 100 feet wide and 4 feet deep from Columbus, Ga., to Chattahoochee, Fla., at the junction of the Flint, which was to be obtained by the removal of logs, snags, and overhanging trees, cutting through the rock and marl shoals, and scouring out sand bars by works of contraction and shore protection. The estimated cost of this work from Chattahoochee, Fla., to Eufaula, Ala., 139 miles, was $145,247, but no estimate of cost for that part between Eufaula and Columbus was ever made.

No modification of the existing project has ever been made.

The existing project is based on House Document No. 241, Forty-second Congress, second session; Annual Report of the Chief of Engineers for 1873, page 699. No maps.

The work carried on during the fiscal year ending June 30, 1912, consisted in snagging and dredging and in building and repairing jetties, at a total cost of $69,243.63. The amount expended for improvement was $17,243.63, and for maintenance, $52,000.

The amount expended on this work to the close of the fiscal year ending June 30, 1912, was $987,753.79, of which approximately $300,000 has been for maintenance.

The project is about 95 per cent completed in the upper section above Eufaula and about 10 per cent in the lower section.

Columbus is the actual head of navigation. Four feet draft can now be carried at ordinary low water from Columbus to the mouth, but at very extreme low-water, such as in 1904, scant 3 feet is the maximum draft that can be counted upon.

The increased depth obtained since adoption of the project is about 2 feet.

During the last few years more liberal appropriations have permitted a more vigorous prosecution of work, and considerable progress has been made on the permanent improvement of the river. In addition to maintaining the river free from snags and obstructions, the channel for a distance of 32 miles below Columbus has been regulated by a system of jetties, and the most serious bars in the upper river have been kept open by dredging where necessary. As a result of this work Columbus has become the head of navigation, and boats are able to reach there at all times except during unusually low water, such as occurred in the fall of 1904, putting a stop to all navigation.

The variation of the water level is 0 to 47 feet at Columbus.

The commerce of this stream consists of cotton, cotton seed, fertilizers, grain, naval stores, provisions, hardware, and general merchandise, and is so combined with that of the Flint and Apalachicola Rivers that a separation is impossible. It is given under the report of the Flint River as 117,115 short tons in 1911, valued at $15,784,029.

The effect of the improvement has been to give to Columbus and all other points on the river water rates, or a material reduction over rates to all-rail points, but the exact amount of reduction can not be stated.

It is proposed to apply the funds available and the appropriation recommended for works of contraction, snagging, and dredging, snagging to be done between Columbus and the mouth of Flint River, works of regulation to extend as far down as Fort Gaines.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	$80,000

COOSA RIVER, GA. AND ALA.

The Coosa is formed at Rome, Ga., by the junction of the Oostenaula and Etowah Rivers, which have their sources in northern Georgia. The general direction of flow of the river is southwesterly to its junction with the Tallapoosa and Alabama Rivers, a distance of about 325 miles. The actual length of the river under improvement is about 211 miles. The project covers the section from Rome, Ga., to its mouth.

The Coosa River has always been navigable for light-draft boats from Rome, Ga., to Greenport, Ala., an estimated distance of 162 miles, and this part of the river is of such a character as to make its improvement by works of contraction and channel excavation entirely practicable, except at Horseleg Shoals, near Rome, Ga., where a lock of low lift is required and is now being constructed.

From Greenport, Ala., to Wetumpka, Ala., a distance of 142 miles, locks and dams are required in conjunction with works of contraction and channel excavation to provide for navigation.

From Wetumpka to the junction of the Tallapoosa River the river is navigable at all seasons.

(*a*) *Coosa River between Rome, Ga., and East Tennessee, Virginia & Georgia Railroad bridge.*—The orginal project for improvement, adopted August 14, 1876, covered the portion of the river from Rome, Ga., to Wills Creek, in Alabama, at a total estimated cost of $180,000, and provided for a crib and timber lock 200 feet long and 32 feet wide, with a 3-foot lift, and for excavation for a 4-foot channel between Rome and Wills Creek.

The act approved June 14, 1880, appropriated $75,000 for continuing improvement, and it is supposed that the funds expended were based upon the estimate of 1878 of $155,616.23, which provided for three locks between Greenport and Woods Island, at the foot of Ten Island Shoals, with a length of 210 feet and a width of 40 feet, an extreme low-water depth of 4 feet on miter sills, together with a 3-foot channel between Locks Nos. 1 and 3.

The act approved September 19, 1890, based on House Document No. 94, Fifty-first Congress, first session, provided for 5 locks and dams from and including Dam No. 4 to the East Tennessee, Virginia & Georgia Railroad bridge. The estimate provided for locks with a clear length of 280 feet and a width of 52 feet, but the river and harbor act fixed the dimensions at 210 feet between miter sills, with a width of 40 feet. The estimate also provided for a connecting channel 100 feet wide and 4 feet deep at extreme low water, at a total estimated cost of $1,160,491, or a total estimated cost for the entire improvement from Rome to the East Tennessee, Virginia & Georgia Railroad bridge of $1,496,107.23. This act also included improvement of the river from the East Tennessee, Virginia & Georgia Railroad bridge to Wetumpka.

The act approved July 13, 1892, modified the act of September 19, 1890, removing the restrictions as to size of locks on the Coosa River.

The act approved March 3, 1905, restricted the improvement of the upper Coosa River for maintenance of the channel between Rome, Ga., and Lock No. 4, in Alabama.

The act approved March 2, 1907, provided for both improvement and maintenance by open-channel work between Rome and Lock No. 4.

The act approved June 25, 1910, provided for the construction of a lock in Dam No. 4, in accordance with plan printed in House Document No. 1421, Sixtieth Congress, second session, at an estimated cost of $282,000, and for the acquisition of site for Dam No. 5, in Alabama, which was recommended be placed at Choccolocco Shoals, the estimated cost of which was $134,000. This act also provided for the construction of a lock 272 feet over all by 40 feet, with a 9-foot lift, at Mayos Bar, near Rome, Ga., at an estimated cost of $241,039, in accordance with plan printed in House Document No. 1115, Sixtieth Congress, second session, which includes cost of lock and dam, gates, valves, maneuvering gear, etc.

The act approved February 27, 1911, appropriated $150,000 for continuing construction of lock in Dam No. 4, and for the construction of Dam No. 5. This act also authorized the raising of Dam No. 4 an additional 3 feet to provide for development of water power. The franchise is granted the Ragland Water Power Co., with the understanding that the work should be paid for by them, to be done under the supervision of the United States, and coordinate with the improvement of the Coosa River under the present project.

The existing project between Rome and Lock 4, adopted August 14, 1876, is for improvement by open-channel work and maintenance thereof, based upon the estimate printed in Annual Report of the Chief of Engineers for 1875 (pt. 2), page 661, and the various modifications, as above stated. The acts approved June 25, 1910, and February 17, 1911, provide for the completion of lock in Dam No. 4, construction of Dam No. 5, and for the construction of a lock and dam at Mayos Bar, near Rome, as provided for in House Documents Nos. 1421 and 1115, Sixtieth Congress, second session. The act of February 27, 1911, also provides for raising Dam No. 4, 3 feet by private parties to provide for water-power development.

During the fiscal year ending June 30, 1912, work consisted in maintenance of the channel between Rome and Lock No. 4, and in continuing construction of Lock No. 4 and lock and dam at Mayos Bar; also in making tests for foundation for Dam No. 5. The amount expended during the fiscal year was $214,533.55, of which $11,105.28 was for maintenance.

To the close of the fiscal year ending June 30, 1912, there had been expended on this section of the Coosa, under the existing project, $1,469,143.79, about $100,000 of which has been applied to maintenance.

The proportion of the approved project accomplished up to June 30, 1912, was as follows: Locks 1, 2, and 3, Coosa River, commenced prior to 1890, have been completed. They are situated. respectively, 0.68 mile, 3.86 miles, and 5.24 miles below Greenport, Ala., and have available lengths of 175 feet and widths of 40 feet.

Lock and Dam 4 (25.89 miles below Greenport), commenced since the adoption of larger dimensions above mentioned, has, together with its appurtenances, been under construction, with desultory appropriations, since 1886, but is now being completed.

Channel improvement has been extended as far down as Dam No. 4, about 200 miles, and navigation is now possible to this point, except at extreme low water, when interruptions occur a short distance above Dam No. 4.

Open-channel work, approximately, 25 per cent completed; lock and dam at Mayos Bar, 50 per cent completed; lock in Dam No. 4, 70 per cent completed.

The ordinary variations of the water surface are, at Rome, Ga., 0 to 30 feet; at Greenport, Ala., 0 to 15 feet; at Wetumpka, Ala., 0 to 50 feet.

Rome, Ga., at the junction of the Oostenaula and Etowah Rivers, is the head of navigation.

On June 30, 1912, the maximum draft that could be carried at ordinary low water between Rome and Lock No. 4 was 3 feet, except at Horseleg shoals, 1½ miles below Rome, over which but 2 feet could be carried; lock now being constructed at Mayos Bar will provide 4 feet over this shoal.

The commerce of this portion of the Coosa consists principally in cotton, cotton seed, fertilizers, timber, lumber, staves, grain, and miscellaneous articles, amounting for the year 1911 to 40,840 short tons, valued at $558,492.

The improvement has resulted in a reduction in railroad rates between points on the river and either Rome or Gadsden of not less than 50 per cent, water rates controlling all shipments to and from the country contiguous to the river.

It is proposed to apply the available balance and the funds recommended in continuing work of improvement and maintenance by open-channel work between Rome and Lock No. 4, and in the completion of lock and dam at Mayos Bar, the lock in Dam No. 4, and construction of Dam No. 5.

Since the date of preparation of the estimates for the ensuing year report has been received from the local officer that the additional sum of $30,000 will be required to complete the lock and dam at Mayos Bar and $14,000 to complete Dam No. 5 and the lock in Dam No. 4, in addition to the $67,000 named in the following money statement. These increases are made necessary on account of delays of contractors and difficulties not anticipated when the original estimates were prepared. It is recommended that these additional amounts be appropriated in the next river and harbor act in order that completion of these works need not be deferred for lack of funds.

(*b*) *Coosa River between Wetumpka and East Tennessee, Virginia & Georgia Railroad bridge.*—On account of the numerous rapids this part of the river has never been navigable.

The original and existing project for the improvement of this section of the river, adopted September 19, 1890, as the result of a survey made in 1889 and modified by Congress July 13, 1892, contemplates slack-water navigation and provides for the construction of 23 locks and dams of varying lifts, of an available length of 280 feet and width of 52 feet, with 6 feet over the miter sills, no lift of lock to exceed 15 feet. In addition, the channel is to be cleared of various rock reefs and points so as to give a least depth of 4 feet, all at an estimated cost of $5,106,422.

By act approved March 4, 1907, printed in Public Document No. 247, a franchise was granted the Alabama Power Co. to construct a lock and dam on the Coosa River for the development of water power at the location of Lock and Dam No. 12, as set forth in survey made in compliance with river and harbor act approved June 13, 1902.

By act approved June 25, 1910, printed in House Document No. 1089, Sixtieth Congress, second session, the improvement of the Coosa River from Wetumpka to its junction with the Alabama and Tallapoosa Rivers, about 11 miles below Wetumpka, was combined with that of the Alabama River.

The existing project for this section of the river, adopted September 19, 1890, modified by acts approved March 4, 1907, and June 25, 1910, provides for 23 locks and dams of varying lifts, of an available length of 280 feet and width of 52 feet, with 6 feet over miter sills, no lift of lock to exceed 15 feet. In addition, the channel is to be cleared of various rock reefs and points so as to give a least depth of 4 feet; also for the improvement of the Coosa River from Wetumpka to junction with the Alabama and Tallapoosa Rivers, with a depth of 4 feet; further, to allow the construction by private parties of a lock and dam at site of proposed Dam No. 12, as set forth in survey report submitted in compliance with act approved June 13, 1902.

Operations during the fiscal year ending June 30, 1912, consisted in care of property at Wetumpka. Amount expended during the fiscal year, $763.23.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $403,743.66, of which about 2 per cent has been applied to maintenance.

The approved project is about 4 per cent completed, resulting in the construction of the lowest lock of the series, known as No. 31, excepting the dam and gates, the excavation of the channel between this lock and the one next above, and the preparation of data and plans for additional locks and dams.

As yet no benefit has been derived from this improvement, and its value is entirely dependent on the completion of the entire system.

The ordinary variation of the water surface at Wetumpka is 0 to 50 feet.

The river is not navigable, and there is no commerce between Wetumpka, and the East Tennessee, Virginia & Georgia Railroad bridge.

Provision should be made for the care of the property belonging to the improvement.

Between Rome, Ga., and Lock No. 4, Ala.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	$25,000

Lock and dam at Mayos Bar, Ga.

Amount (estimated) required to be appropriated for completion of existing project	$30,000

Lock No. 4 and Dam No. 5.

Amount (estimated) required to be appropriated for completion of existing project	$67,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	67,000

Consolidated.

Amount (estimated) required to be appropriated for completion of existing project	$67,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	92,000

INSIDE WATER ROUTE BETWEEN SAVANNAH, GA., AND FERNANDINA, FLA.

This route consists of a series of bays and tidal sloughs, making a continuous waterway not exposed to ocean waves except at a few points where it crosses the wider sounds. Vessels have not always used the same route. In its natural condition the usual route afforded a depth of not less than 3 feet at extreme low water. This minimum depth occurred at only a few points; elsewhere the depth was ample. The project of 1892 provided for the formation of a navigable channel 7 feet deep at mean low water. The estimated cost of improvement was $105,000, provided the entire sum be made available at one time. The total amount was reached with the appropriation made by the river and harbor act of March 3, 1905, but the improvement was still unfinished, because the appropriations had been small in amount and extended over a very long period, as fully set forth in the Annual Report of the Chief of Engineers for 1906, page 1208.

The route has been modified since the beginning, sometimes by special projects for which separate appropriations were made, as in the case of Skidaway Narrows and Club and Plantation Creeks, and at other times by modifications made in the ordinary course of maintenance. The effect of these changes has been to shorten the route, or to make it easier of navigation, or to afford greater shelter. Its length as it exists at present, from Savannah to Fernandina, is 151 miles. Touching at Darien increases the distance by 8 miles and at Brunswick by 10 miles.

The total amount expended under the project of 1892 up to June 30, 1912, was $171,576.91 (of which $107,066.97 was for maintenance), which, added to the amount expended for Jekyl Creek and Romerly Marsh, viz, $71,108.77, makes a total of $242,685.68. The sum of $664.40 was collected during the past year from the surety on contract of failing contractors and deposited to the credit of the appropriation.

The river and harbor act of March 2, 1907, provided for a resurvey of the entire waterway, to determine the best route for further improvement. Report of this survey, with estimate of cost, is printed as House Document No. 1236, Sixtieth Congress, second session, which embodies a plan of improvement with estimate of cost. This document contains an index map of the waterway showing the new route to be improved. This project was adopted by the river and harbor act approved July 25, 1912. It provides for a continuation of the improvement to the same general depth of 7 feet, at mean low water, but with a widening of the channel from a minimum width of 50 feet to a uniform width of 150 feet. It also provides for a departure from the main route, as it previously existed, in two instances: First, from Romerly Marsh to Skidaway Narrows, and, second, from Mud River to Front River, and also for the improvement of auxiliary channels, as follows: Threemile Cut, near Darien, on the branch route between Darien and Brunswick, with a depth of 7 feet at mean low water; route around St. Simons and St. Andrews Sounds, affording a low-water depth of 3 feet, and a branch route to reach the wharves along the southerly end of Cumberland Island, affording a low-water depth of 8 feet. The plan also provides for including the proposed route by way of Club and Plantation Creeks as an integral part of the improvement. The improvement of the Club and Plantation Creeks route has since been completed.

The estimated cost of the improvement is $237,700. This includes the amount necessary to complete the Club and Plantation Creeks improvement, viz, $20,700, which amount was provided in the river and harbor act of June 25, 1910. The estimates should therefore be reduced to $217,000. This provided for the payment of $75,000 toward the purchase of a dredge to use upon this route and in the improvement of the Savannah River below Augusta, Ga., but due to the delay in adopting the project the necessary plant for the Savannah River has already been acquired and it is certain that $75,000 would not be sufficient to procure a suitable plant for the inside waterway, and it is doubtful if purchase of a dredging plant would be justifiable for this work alone. The question of omitting the purchase of a dredge and executing the work by contract will receive due consideration. The report upon which the appropriation is based indicates that, under the circumstances, the latter method would be the most justifiable.

All work during the fiscal year was for maintenance and consisted of the dredging of 27,744 cubic yards of material, place measurement, from Mud River, which restored the project width and depth of channel at that locality, and the raising of 850 feet of the training wall in Jekyl Creek to about the elevation of mean high water by the addition of 1,024.6 tons of small stone. The necessary surveys were also made to determine the amount of material removed by dredging.

The project depth of 7 feet, at mean low water, has been obtained throughout the route, with the exception of the link known as Skidaway Narrows, which was originally improved under a separate project calling for a 6-foot depth. This link is now an integral part of the inside water route.

It is proposed to apply the available balance and additional appropriation recommended toward carrying out the new project provided by the river and harbor act of July 25, 1912, and toward maintaining a depth of 7 feet, at mean low water, throughout the route by dredging and by repairing and extending the existing regulation works, if necessary.

The value of the commerce passing over this route was estimated in 1890 at between $200,000 and $300,000 per annum. During the calendar year 1911 the commerce amounted to 167,730 short tons, valued at $2,430,682. This includes lumber and timber towed over the route in rafts. Little, if any, of this commerce passed over the whole extent of the route.

Between Brunswick and St. Andrews Sound 22 vessels were towed through Jekyl Creek during the calendar year 1911, which otherwise would have had to enter through St. Andrews Sound, involving an additional cost to the charterers. The towing of timber rafts is also carried on to much better advantage now than before improvement and less time is now lost waiting on the tide where shoals previously existed.

It is impracticable to determine the effect of this improvement upon freight rates, as at present the different portions of the route are used locally, and comparatively few vessels engaged in commerce pass over the entire length of it.

Amount (estimated) required to be appropriated for completion of existing project	$177,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	100,000

APALACHICOLA BAY, FLA.

The town of Apalachicola lies at the mouth of the Apalachicola River, and the deep water along the river front forms the inner harbor.

At the mouth of the river, between the inner harbor and the 3-fathom anchorage area in Apalachicola Bay, there is a bar of which the original width between 8-foot contours was 7,000 feet and the minimum depth of water 3.5 feet. Across this bar the lumber exported is lightered either to the 3-fathom anchorage in Apalachicola Bay or through Bulkhead Shoals to the anchorage of Carrabelle, 25 miles distant. The 3-fathom anchorage area is entered via West Pass, where originally the depth was about 13 feet. The original depth over Bulkhead Shoals was less than 4 feet.

The size of the harbor is approximately 108 square miles, situated 160 miles, by water, east of Pensacola Harbor.

The original project, adopted June 14, 1880, provided for dredging a channel 100 feet wide and 11 feet deep through the bar at the mouth of the river, the width of cut to be increased to 200 feet if the results justified this enlargement.

This project was amended September 19, 1890, to include dredging a channel 9 feet deep and not less than 100 feet wide across the Bulkhead Shoals.

Upon this project as amended has been expended $154,000, of which $100,000 has been applied to maintenance in repeated dredging of the cut across the bar at the mouth of the river. The channel through Bulkhead Shoals, dredged in 1891–92, remains practically unchanged, with a minimum depth of 8 feet at mean low water.

Prior to the adoption of any project of record in this office, $18,700 was expended on this improvement—1833–1839—but the object and results of such expenditures are unknown.

By act approved March 3, 1899, a new project was adopted, which provided for a channel 100 feet wide, 18 feet deep at mean low water, through the West Pass along the northern shore of St. George Island and across the bay to the water front of Apalachicola, estimated to cost $350,000, and $20,000 or $30,000 annually for maintenance of completed work.

The amount expended on this project was $130,679.26.

The existing project was adopted by act of Congress approved March 2, 1907, by which the previous project was amended so as to provide for a channel across the bar at the mouth of the Apalachicola River not less than 100 feet wide and 10 feet deep at mean low water, and a channel not less than 150 feet wide and 18 feet deep through Link Channel and West Pass to the Gulf of Mexico, at an estimated cost of $85,000, and $17,500 annually for maintenance after completion.

The existing project is covered by House Document No. 422, Fifty-ninth Congress, first session. No maps.

Operations during the fiscal year ending June 30, 1912, consisted in dredging under contract and in repairs to bulkhead. There was expended the sum of $26,482.76, of which $20,500 was applied to maintenance. The amount expended on this project up to the close of the fiscal year ending June 30, 1912, was $131,337.89. Since beginning work on this harbor there has been expended approximately $120,000 for maintenance. This does not include $650.29 for surveys at East Pass.

A channel 10 feet deep and 100 feet wide across the bar at the mouth of the river has been completed, and for the protection of this channel from westward-moving silt a bulkhead to the east of it has been built. The length of this bulkhead is 6,900 feet.

The proportion of the approved project accomplished up to June 30, 1912, is as follows: Through Link Channel and West Pass, 20 per cent; mouth of Apalachicola River, 80 per cent; the maximum draft that could be carried from Apalachicola to Link Channel was 9 feet; through Link Channel, 17 feet; Link Channel to the Gulf, 12 feet; increased depth secured at mouth of the river, 2 feet.

The ordinary range of the tide is about 2 feet.

The commerce of this port is in timber, cotton, naval stores, staves, a large quantity of dressed and kiln-dried lumber, shingles, laths, and miscellaneous freight, the total value for the calendar year 1911 being reported by the customhouse as $1,931,470 for both Apalachicola and Carrabelle. Of this amount it is estimated that 60 per cent, or $1,158,882, should be credited to the port of Apalachicola.

The portion of the project now completed gives greatly increased facilities to the commerce of this port and a substantial reduction in freight rates on coastwise commerce. The exact amount of this reduction and the reduction on foreign commerce can not yet be stated.

It is proposed to apply the balance available and funds recommended in maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$20,000

CHARLOTTE HARBOR, FLA.

Charlotte Harbor lies 70 miles south of Tampa Bay. From the entrance from the Gulf of Mexico it extends easterly about 11 miles and then northerly about 11 miles. The width of the harbor is about 5½ miles. The total area is 111 square miles. The general depth is from 5 to 15 feet, with deeper water in places along the middle line. The entrance, Boca Grande Pass, is straight and fairly stable in position and depth, with a least channel depth of 19 feet. Within the entrance there is an anchorage having an area of 580 acres and a depth of 18 feet and over. Between this anchorage and Punta Gorda there is an available channel depth of 15 feet, excepting the shoals, from 6 to 10 miles from the entrance, over which originally a least depth of 9 feet existed and in the channel leading to the wharves at Punta Gorda in the mouth of Peace Creek at the northern extremity of the harbor, which in its natural condition gradually shoaled to a depth of 8 feet at the upper end.

The plane of reference is mean low water.

The width of channel in its original condition was indeterminate, the shoal places being on broad flats.

The distance from the entrance at Boca Grande to the main entrance to Tampa Bay is 67½ miles and to the northwest entrance to Key West Harbor is 170 miles.

The original project for the improvement of Charlotte Harbor adopted in 1891 contemplated a channel 200 feet wide and 12 feet deep from the entrance to the wharves at Punta Gorda, at an estimated cost of $127,500, reduced in 1896 to $100,000. This project was practically completed in 1899, although a portion of the channel leading to the wharves at Punta Gorda was only 120 feet wide and other portions were only 160 feet wide. The widths provided appeared to be sufficient for the needs of commerce.

The amount expended on original and modified projects, prior to operations on existing project, was $100,000.

The existing project contemplates securing an available channel depth of 24 feet and a width of 300 feet from the Gulf of Mexico to Boca Grande, at an estimated cost of $40,000 and $4,000 annually for maintenance, provided local interests contribute one-half the estimated original cost thereof. This project was adopted by Congress July 25, 1912, and is based upon reports printed as House Document No. 699, Sixty-second Congress, second session (with map).

There has been no modification of the existing project.

There were no operations during the year and no expenditures made, the project not having been authorized until after the close of the year.

The maximum draft that could be carried June 30, 1912, over shoalest part under improvement was 19 feet.

The mean tidal range is 1.4 feet.

The commerce of this locality amounts to 519,000 short tons. It consists of phosphate rock, lumber, ties, crates, naval stores, fruits, and vegetables, valued at $3,005,000.

It is proposed to apply the amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, to maintenance in order to keep the improvement available.

Amount appropriated by river and harbor act approved July 25, 1912	$20,000
Amount available for fiscal year ending June 30, 1913	20,000
Amount required for expenditure in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 4,000

CLEARWATER HARBOR AND BOCA CEIGA BAY, FLA.

These are the names applied to portions of the sound lying between the mainland of the State of Florida and the keys bordering the west coast, north to Tampa Bay. Boca Ceiga Bay extends northward, and may be considered as beginning opposite Pass-a-Grille. Clearwater Harbor lies to the north of Boca Ceiga Bay. These two sheets of water are connected by a very narrow waterway known as "The Narrows." The northern limit of Clearwater Harbor may be taken to be opposite Big Pass. North of Clearwater Harbor the sound is known as St. Josephs Sound. Boca Ceiga Bay is about 12½ miles long and has an average width of about a mile. The Narrows are about 4½ miles in length and have an average width of about 200 yards. Clearwater Harbor is about 8 miles long, and varies in width from one-half mile to 1¾ miles. Before improvement no well-defined channel existed through the intracoastal waterway formed by the bodies of water named above. Following the best water, depths were encountered in Boca Ceiga Bay of from 2 to 31 feet; in The Narrows of from one-half to 6 feet; and in Clearwater Harbor of from 2 to 21 feet.

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[1] Exclusive of amount available for fiscal year 1913.

The original, which is the existing, project was adopted June 25, 1910, and contemplates securing a channel from Clearwater Harbor to Boca Ceiga Bay and through the upper part of said bay 5 feet deep and 50 feet wide and a channel from the lower end of said bay to Tampa Bay 7 feet deep and 100 feet wide, at an estimated cost of $59,000, increased to $79,000 in 1912, with $3,000 annually for maintenance after completion. This project is based upon plans submitted in House Document No. 1190, Sixtieth Congress, second session (with maps).

No modifications have been made in the existing project.

During the fiscal year the necessary cuts were made to secure a channel from Tampa Bay to the lower end of Boca Ceiga Bay 7 feet deep and 100 feet wide, except in one cut where natural depths of only a fraction of a foot less than 7 feet are found; a channel through Boca Ceiga Bay and part way through The Narrows 5 feet deep and 50 feet wide; and a channel in Clearwater Harbor from the point reached June 30, 1911, through the southern part of this harbor and part way through The Narrows 5 feet deep and 50 feet wide. The total length of the cuts made amounted to 21,858 feet. The expenditures during the year amounted to $38,618.78, all of which was for new work.

The total amount expended on this project up to the close of the fiscal year ending June 30, 1912, amounted to $59,000.

The project is 85 per cent completed. Channels of the project depths and widths are available except for a distance of 6,198 feet in The Narrows, and for a distance of 1,600 feet in Tampa Bay. In The Narrows a depth of 1.5 feet is encountered, which is the maximum draft that could be carried over the shoalest portion of the improvement June 30, 1912. The length of the improved section is a little less than 24 miles. On account of the work still remaining to be done in The Narrows no benefit has as yet been derived from the improvement.

The mean range of tide is 1.8 feet.

The distance between named limits of authorized channels is 28 miles.

The waterway is navigable in fact throughout its length.

The commerce for the year 1911 amounted to 5,175 short tons, valued at $354,318, a decrease of 27.1 per cent below that of the preceding year. The commerce consists principally of fish, gasoline, ice, general merchandise, sponges, and wood. As all water-borne commerce must still go outside in small boats, the conditions are not favorable at the present time, but a reasonable increase can be expected upon completion of this improvement. The completion of the improvement will afford a much shorter water route from Tampa and points in the waterway than the present rail hauls, and much better freight rates will probably follow. In its present state the improvement has had no effect on freight rates.

It is proposed to use the amount estimated as required for expenditure during the fiscal year ending June 30, 1913, in maintaining the improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement $3,000

FERNANDINA HARBOR, FLA., AND CUMBERLAND SOUND, GA., AND FLA.

These two works of improvement were consolidated by the river and harbor act approved June 25, 1910.

(*a*) *Fernandina Harbor.*—As will be seen from Coast Survey Chart No. 453, the lower end of Amelia River forms a deep basin opposite the city of Fernandina, which portion of the river is known as Fernandina Harbor. The lower end of the harbor connects with Cumberland Sound and is 3½ miles from the bar. The harbor is about 1,300 feet in width at the entrance and about 2 miles long. It embraces about 160 acres of well-sheltered anchorage ground with a depth greater than 25 feet at mean low water, but is somewhat obstructed by small shoals. The harbor is located 58 miles, by water, north of Jacksonville Harbor, Fla., and 128 miles, by water, south of Savannah Harbor, Ga.

A project providing for such extensions of the depth and width of the channel in front of the city of Fernandina as will meet the requirements of commerce will be found printed as House Document No. 388, Fifty-ninth Congress, first session.

The improvement proposed consisted in dredging a channel with widths varying from 400 to 600 feet and depths from 20 to 24 feet at mean low water, in front of and to a short distance above (southwest of) the city of Fernandina. The estimated first cost of this work was $115,000, with $15,000 at periods of every two or three years for maintenance after completion.

This project was adopted by act of Congress approved March 2, 1907, which appropriated $115,000 for its completion.

Work under the project was begun September 14, 1907, and completed July 28, 1908.

No work was done during the fiscal year other than the making of an examination of the improved channel to ascertain its condition at the close of the year.

On June 30, 1912, the controlling depths in the channel fronting the city of Fernandina were as follows: From the mouth of Lanceford Creek to the upper end of Hill's dock, 22 feet, at mean low water, and from this latter point to the entrance to the inner harbor, 24 feet, at mean low water, except on one small lump, opposite Center Street, which has a depth of 23 feet, at mean low water, over it. Very little shoaling has taken place since the project was completed. Soundings indicate some caving in of the sides, with the depth on the edges of the channel slightly diminished.

The mean rise and fall of the tide is 6 feet.

The amount expended under the present projects for the improvement of Fernandina Harbor and Cumberland Sound up to June 30, 1912, was $2,644,629.53, of which $434,691.54 was for maintenance.

Up to the time these two works were consolidated under the title "Improving Fernandina Harbor, Fla.," viz, June 25, 1910, there had been expended under the present projects for each work the following: For Cumberland Sound, $2,468,023.71 (of which $368,139.31 was for maintenance), and for Fernandina Harbor, $110,053.59. The total amount expended for these two works up to June 30, 1912, was $3,577,129.53. A total of $14.40 was received from the sale of blue prints and unserviceable property and deposited to the credit of the appropriation.

It is proposed to expend the available balance and additional appropriation recommended in maintaining the improvement.

Before the improvement of Cumberland Sound, in 1879, which constitutes the ocean entrance to Fernandina Harbor, the annual in and out bound tonnage at Fernandina was about 300,000 short tons, and the value of imports and exports estimated at about $2,500,000. The commerce of the port during the calendar year 1911 amounted to 511,133 short tons, with a value of $10,113,836. The chief articles of export are lumber, phosphate rock, and naval stores.

The effect of the improvement of Cumberland Sound has been to cause a reduction in freight rates of from 25 to 40 per cent. It has not been practicable as yet to determine what further effect, if any, the improvement of Fernandina Harbor has had upon these rates.

The present project will be found printed as House Executive Document No. 388, Fifty-ninth Congress, first session, containing map. See also Annual Report of the Chief of Engineers for 1910, page 404.

A map showing conditions June 30, 1908, will be found opposite page 1358, Annual Report of the Chief of Engineers for 1908.

(*b*) *Cumberland Sound, Ga. and Fla.*—The entrance to Cumberland Sound affords an anchorage basin, between the jetties, 4 miles in length, with an average width of 2,000 feet and a depth varying from 24 to 60 feet at mean low water. The distance from the 36-foot curve outside the entrance to the city wharves is 7 miles.

In its original condition the available depth of the entrance varied from 11 to 12.5 feet at mean low water. The point of crossing the bar was subject to very great changes in location, moving in a series of years as much as 1½ miles.

The project of improvement submitted in 1879 and revised by a Board of Engineers in 1891 provides for the construction of two low jetties from the shore on opposite sides of the entrance and extending seaward across the bar upon lines so direct that the ends will be parallel to each other and about 3,900 feet apart. These jetties were intended to establish a low-water channel across the bar not less than 19 feet in depth. The cost of the improvement was originally estimated at $2,071,023, and as modified at $1,606,500 for the completion of low jetties and at $2,079,500 if high jetties were found necessary. There was expended under this project $932,500.

The present project, which was adopted by act of Congress of June 3, 1896, provides for the establishment of a channel across the bar 19 feet deep at mean low water by the construction of two jetties of stone, built to the level of high water, and resting on a foundation of brush mattresses, on the same lines as those in the previous project, the scour between the jetties to be aided by dredging, if necessary, the total cost of the improvement, at the time of this project, to be $2,350,000, exclusive of amounts previously appropriated.

For amount expended in the improvement of Cumberland Sound, see statement under (*a*) Fernandina Harbor.

By this expenditure two stone jetties have been constructed and a seagoing dredge provided, which together produced a navigable channel with a minimum width of 400 feet and a controlling depth of 24.5 feet at mean low water.

All work done during the fiscal year was for maintenance. This work placed the two jetties in very fair condition, but since the completion of the work other portions of these jetties have suffered a slight loss of height, either by settlement or more likely by the washing off of the top stone, and this action may be expected to continue. The Pelican Shoals, on the north of the channel of the main entrance, show a slight change, the inner end shoaling and the outer end deepening.

The flow between the jetties, which originally was strongest along the north jetty, is now very uniformly distributed over the whole width between them, the maximum strength of the same now being found along the south jetty.

The "middle ground" between the jetties continues to move seaward at the usual rate of about 400 feet per year, all of this area having been materially deepened. The tendency to form a channel along the south jetty and thence straight out to sea becomes more marked since the raising of the outer end of the south jetty, the least depth along this line being at present 24 feet at mean low water, increasing to more than 30 feet over most of its length.

The 30-foot curve beyond the bar has not moved seaward at all during the past 12 months. Its form is roughly the arc of a circle with a mile and a quarter radius, its center being midway of the channel at the outer ends of the jetties. The curve continues until it intersects the 30-foot contour as it originally existed, thus limiting the area into which the eroded material between the jetties has been pushed.

The dike work on the south end of Cumberland Island is at present in excellent condition. The outer beach of Cumberland Island for some 2½ or 3 miles above the south jetty is advancing seaward, so that no immediate trouble is anticipated from encroachment upon this portion of the beach.

On June 30, 1912, the controlling depth in the channel, as indicated by the lighted ranges, was 23 feet at mean low water, but by departing slightly from the lighted range and following the buoyed channel a least depth of 24 feet at mean low water can be carried throughout.

The mean rise and fall of the tide is 6 feet.

The project for the improvement of Cumberland Sound was reported as completed in the Annual Report of the Chief of Engineers for 1905, page 1287.

It is proposed to apply the available balance and additional appropriation recommended to such dredging as may be necessary to mintain an ample channel, easy of navigation, and to make such repairs to the permanent structures as from time to time may become necessary.

As Cumberland Sound merely constitutes the ocean entrance to Fernandina Harbor, the commerce is given under that head.

The effect of the improvement has been to cause a reduction in freight rates of from 25 to 40 per cent.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$40,000

HILLSBORO BAY, FLA.

The bay is an arm of Tampa Bay. It is about 9 miles long and 4½ miles wide. Tampa is located at its head and is 259 miles from Key West and 550 miles from New Orleans. Before improvement the channel from deep water in Hillsboro Bay to the city of Tampa was narrow and tortuous, with a least depth of about 4 feet at mean low water.

The first project, adopted in 1880, provided for a channel 9 feet deep at mean low water, 150 feet wide in the bay and 200 feet wide in Hillsboro River. In 1888 the proposed depth was reduced to 8 feet. This project was practically completed in 1893 at a cost of $80,000.

A second project, adopted March 3, 1899, contemplated a channel 12 feet deep at mean low water, 150 feet wide in the bay and 200 feet wide in the river, from the 12-foot contours in the bay to a point 100 feet south of the Lafayette Street Bridge in Hillsboro River. The estimated cost was $300,000. The total expenditure under this project was $275,000. The project was completed, except that the width in a small part of the bay channel was only 110 feet.

A third project, adopted March 3, 1905, provided for a channel 20 feet deep at mean low water and 150 feet wide from the lower bay to the mouth of Hillsboro River, with a turning basin at inner end 450 feet wide and 1,050 feet long, at an estimated cost of $448,350. The work was completed on February 29, 1908. The full depth was obtained in the channel excepting in the northwesterly end of the turning basin, where there is a minimum depth of 16.8 feet at mean low water, over a small area where ledge rock is found.

The amount expended on original and modified projects prior to operations under existing project was $740,180.13.

The existing project, adopted June 25, 1910, is based on plans printed in House Document No. 634, Sixty-first Congress, second session (with maps), and provides for obtaining a channel 200 feet wide and 24 feet deep at mean low water from Tampa Bay to the turning basin at the mouth of Hillsboro River, following the line of the 20-foot channel completed under previous project; a channel 300 feet wide and 24 feet deep from the turning basin eastward to the mouth of the Ybor Estuary, thence northward and up the estuary; and a channel of the same dimensions from the mouth of the estuary southward through Sparkmans Bay and the present Tampa northern channel to the main channel. The estimated cost of this work is $1,750,000, with an annual charge for maintenance of $20,000 for five years and for $10,000 thereafter.

The initial appropriation for work under this project was made and the project, therefore, adopted, subject to the following conditions:

That no expenditure be made on that part of the harbor between the new turning basin and Ybor City until the Secretary of War is assured that the local municipality will construct wharves or ships having an available length of not less than 1,400 feet, which shall be open for the use of the general public under reasonable regulations and charges, and also that the municipality has obtained such control of the property for at least 700 feet on each side of the proposed Ybor Channel throughout its length as will insure its use primarily in the interest of general commerce on equal terms to all, and that all wharfage charges and regulations shall be reasonable and fully controlled by the municipal authorities and subject to the approval of the Secretary of War.

This project was modified February 16, 1912, so as to provide for a straight channel in Ybor Estuary in lieu of the channel shown on the map forming part of House Document No. 634, Sixty-first Congress, second session.

The existing project is to secure a channel 200 feet wide and 24 feet deep at mean low water from Tampa Bay to the turning basin at the mouth of the Hillsboro River, following the line of the 20-foot channel completed under previous project; a channel 300 feet wide and 24 feet deep from the turning basin eastward to the mouth of the Ybor Estuary, and thence northward and up the estuary in a straight line; and a channel of the same dimensions from the mouth of the estuary southward through Sparkman Bay and the present Tampa northern channel to the main channel.

The amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $320,751.94, none of which was for maintenance.

The river and harbor act of February 27, 1911, made an appropriation of $300,000 for continuing improvement and authorized continuing contracts for prosecution of the project in the additional sum of $300,000. The sundry civil act approved August 24, 1912, appropriated $200,000, leaving a balance of $100,000 yet to be appropriated.

The existing project is about 30 per cent completed. A channel 24 feet deep is available from Tampa Bay to the turning basin at the mouth of the Hillsboro River. In section A and the southern half of section B this channel is not full width. In the remainder of section B and section C for 25,000 feet the channel is full width. It is 150 feet wide for the remainder of section C. In section D the channel is 150 feet wide. The turning basin is full depth except along the western edge, where rock was encountered. The channel eastward from the turning basin affords a minimum depth of 16 feet, which is the minimum draft that could be carried on June 30, 1912, over that portion of the improvement below the Seaboard Air Line Railway bridge. As a result of the improvement many large ships have been coming to the port and heavier cargoes are being taken. The full depth of water available is being utilized. The distance from the lower end of section A in Tampa Bay to the Seaboard bridge, the head of navigation for seagoing vessels, is 9 miles. The distance from the bridge to deep water in the Gulf of Mexico is 41 miles. Hillsboro Bay is navigable over its entire area for small boats.

The mean range of tide is 2.2 feet.

The commerce for the year 1911 amounted to 1,637,676 short tons, valued at $29,904,179, an increase of 49.7 per cent over 1910. The commerce consists principally of cigars, coal, crude oil, fertilizers, fish, lumber, naval stores, oranges, phosphates, tobacco leaf, vegetables, and general merchandise. Three lines of steamers give regular service to New Orleans, Habana, Key West, and New York. Two of these lines each added a steamer to the Tampa run during the year. Local commerce between Tampa and other points on Tampa Bay, Sarasota Bay, Manatee River, and Boca Ceiga Bay is carried on by four lines of steamers. In addition to this there are many small gasoline boats making more or less regular runs.

Freight rates have been reduced from 30 to 40 per cent.

It is proposed to apply the amount estimated as required for expenditure during the fiscal year ending June 30, 1914, in rock removal in furtherance of the existing project. The additional work proposed is necessary in order to make the improvement available.

July 1, 1911, balance unexpended	$434,406.75
June 30, 1912, amount expended during fiscal year, for works of improvement	155,158.69
July 1, 1912, balance unexpended	279,248.06
July 1, 1912, outstanding liabilities	13,616.81
July 1, 1912, balance available	265,631.25
Amount appropriated by sundry civil act approved Aug. 24, 1912	200,000.00
Amount appropriated by river and harbor act approved July 25, 1912	250,000.00
Amount available for fiscal year ending June 30, 1913	715,631.25
July 1, 1912, amount covered by uncompleted contracts	282,531.33
Amount of continuing contract authorization, act of Feb. 27, 1911	300,000.00
Amount appropriated under such authorization	200,000.00
Amount yet to be appropriated	100,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 700,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1][2] 200,000.00

HARBOR AT KEY WEST, FLA., AND ENTRANCE THERETO.

The harbor of Key West consists of a pocket in the reef, protected on the eastern side by the island of Key West and the submerged reef and on the northern and western sides by the submerged reef. Considering the harbor as commencing near Fort Taylor and extending to the northern end of Man-of-War Harbor, its approximate dimensions become 2 miles by one-quarter mile. The lower end of the harbor opposite the island proper accommodates at mean low water vessels drawing about 27 feet. The water becomes shoaler toward the northern end of Man-of-War Harbor, where vessels could not be accommodated drawing more than 22 feet. The entrance referred to herein is the northwest channel. In addition to this channel there are four other channels leading to the harbor, generally known as the southwest channel, the main ship channel, the southeast channel, and the west channel. The main ship channel at mean low water will accommodate vessels drawing 27 feet and the west channel 30 feet. All of these channels are somewhat obstructed by coral heads, so that ships of as great draft as stated can only be brought in by pilots thoroughly familiar with the said entrances. The northeast channel before improvement afforded a depth of about 10.5 feet at mean low water over the northwest bar. In addition to the harbor proper a large anchorage area, affording a depth of about 34 feet, lies in a southwesterly direction from Whitehead Point and distant about 2 miles therefrom.

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[1] Exclusive of amount available for fiscal year 1913.

[2] Of this amount $100,000 is for continuing contract work authorized by the act of 1911.

Key West is 516 statute miles from Jacksonville and 644 statute miles from New Orleans and 246 statute miles from Tampa.

The original project, adopted in 1889, contemplated a channel through the northwest passage 17 feet deep at mean low water. This was to be secured by building two stone jetties, one to the northwest and one to the west of the channel, converging toward the bar, and by dredging is necessary. The estimated cost of the east jetty was $500,000.

This project was based upon the report published in House Ex. Document No. 145, Fiftieth Congress, second session. (No maps.)

The act of March 2, 1907, modified the project by authorizing continuance of work on the existing jetties or the building of training walls, in the discretion of the Secretary of War. No estimate of cost has been adopted for this additional work.

The river and harbor act approved July 25, 1912, further modified this project so as to provide also for the deepening and widening of the main ship channel at the entrance and at Triangle Shoals, so as to afford a channel 30 feet deep and 300 feet wide, and for removing shoals in the anchorage in accordance with report submitted in House Document No. 706, Sixty-second Congress, second session (contains maps), at an estimated cost of $48,000.

The existing project as modified is to deepen and widen the main ship channel at the entrance and at Triangle Shoals so as to afford a channel 30 feet deep and 300 feet wide at mean low water; to remove the shoals in the anchorage and to maintain a channel 17 feet deep and of sufficient width through the northwest passage.

During the fiscal year the dredge *Key West* worked on the northwest channel from December 14, 1911, to April 23, 1912. A total of 240,441 cubic yards of material was removed, at a cost of $23,185.10, from the northwest bar, restoring the channel to a depth of 17 feet and a width of 200 feet.

At the close of the fiscal year the sum of $736,058.21 had been expended on the project as it stood before it was modified by the river and harbor act approved July 25, 1912, of which amount the sum of $47,874.15 was applied to removal of reefs from the main ship channel and to the maintenance of the improvement.

A channel 17 feet deep and 200 feet wide at mean low water exists through the northwest passage.

The jetties are about 60 per cent completed. Nothing has been done toward removing coral heads from main ship channel and anchorage.

The maximum draft that could be carried at mean low water June 30, 1912, through the northwest passage was 17 feet and through the main ship channel was 27 feet.

The mean variation of the tide amounts to 2.6 feet.

The amount of commerce during the year 1911 amounted to 764,775 short tons, valued at $25,711,987, consisting principally of cattle, cigars, coal, fish, canned turtle soup, lumber, merchandise, naval stores, railroad iron, stone, tobacco leaf, and water. The commerce increased 74.3 per cent during the year.

The improvement of the northwest passage affords a short cut for vessels drawing less than 17 feet of water plying between Tampa and Key West. This improvement, however, has not affected freight rates. By virtue of steamship competition Key West enjoys much more favorable freight rates than points farther north in the State, but this is not in any way due to improvements made by the United States.

It is propose to use the amount estimated as a profitable expenditure during the fiscal year 1914 in maintaining the channel through northwest passage.

Amount (estimated) required to be appropriated for completion of existing project	Indefinite.
Amount that can be profitably expended in fiscal year ending June 30. 1914, for maintenance of improvement	$15,000

ENTRANCE TO ST. JOSEPHS BAY, FLA.

St. Josephs Bay had never been under improvement by the Government up to adoption of project by act of July 25, 1912. The depth on the bar was about 20 feet, with varying widths. Length of the bar on channel line was about 7,330 feet. Size of the harbor, approximately 50 square miles, with depths varying from about 30 to 36 feet. The harbor is situated about 115 miles east of Pensacola Harbor.

The existing project, adopted by the river and harbor act of July 25, 1912, provides for a channel 24 feet deep and 300 feet wide over the bar, at an estimated cost of $40,000, of which sum $20,000 is to be borne by private interests.

The project is based on House Document No. 660, Sixty-second Congress, second session. Contains maps.

For reference to previous examination and survey, see House Document No. 464, Sixtieth Congress, first session, without map.

At the end of the fiscal year 1912 work had not been commenced.

The ordinary range of the tide is about 1.4 feet.

The commerce of the port consists principally of timber and its products, estimated at about $900,000 per annum.

Completion of the project will facilitate shipping interests of the port to a large extent.

It is proposed to apply the funds available and those to be supplied by private interests toward the completion of the project, additional funds recomended to be applied to maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$10,000

ST. LUCIE INLET, FLA.

St. Lucie Inlet is located on the east coast of Florida, about 260 miles south of Jacksonville and about 100 miles north of Miami. The inlet resulted from a cut, 30 feet wide and 5 feet deep, made by residents in the vicinity in 1892, across a narrow strip of land separating the ocean from Indian River. The inlet has widened from scour until it is now over one-half mile in width. A narrow channel having an available depth of about 6 feet meanders through the inlet. The channel is bordered by extensive shoals, which in the inlet afford a depth of only about 3 feet, and rise to above low water inside the inlet. A sand bank from 3 to 6 feet in height has formed from the south point of the inlet to within 75 feet of Long Point.

The St. Lucie River joins the Indian River immediately opposite the inlet. This river is tidal for a distance of about 12 miles from its mouth. It affords depths by way of its northwest branch of 12 feet or more to a point 8 miles from its mouth (2 miles above Stuart), except for a short stretch just below Stuart, where but 11 feet is available; from this point the depth gradually decreases to 8 feet at the head of the northwest branch (a distance of 3 miles). Twelvemile Creek empties into the northwest branch; and according to the report of Col. Benyaurd (H. Doc. 548, 55th Cong., 2d sess.) and the reports of local residents, a depth of 10 feet can be carried up this stream for a further distance of 15 miles.

The country in the vicinity of the St. Lucie River and along the Indian River is being rapidly developed and is capable of a far greater development than has yet taken place. Some of the most extensive pineapple fields and vegetable gardens on the east coast of Florida are located in this vicinity. Its further development is greatly handicapped by the expense of marketing produce and the uncertainty of being able to get it to market at any price. All produce at present is dependent upon a single railroad for delivery to Jacksonville, from which point it is distributed to various points throughout the country.

The following letter of the Chief of Engineers submitting report on a recent examination is printed in House Document No. 675, Sixty-second Congress, second session.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, March 30, 1912.

SIR: I have the honor to submit herewith, for transmission to Congress, report dated August 29, 1911, by Capt. J. R. Slattery, Corps of Engineers, on preliminary examination of St. Lucie Inlet, Fla., called for by the river and harbor act of February 27, 1911.

This act called for a report on the advisability of improving this inlet to 12 or 14 feet depth.

This office, under date of June 23, 1898 (H. Doc. No. 548, 55th Cong., 2d sess.), reported this inlet as worthy of improvement to 8 feet depth at mean low water at a cost of $24,600, or 10 feet depth at a cost of $230,000, or 12 feet depth at a cost of $484,000 for channels dredged to 200 feet wide inside and 300 feet wide outside the bar; the ocean entrance to be protected by a breakwater costing $347,000 more if extended to 18 feet depths and $729,000 if extended to 24 feet depths in the ocean.

Also, under date of January 7, 1909 (H. Doc. No. 1312, 60th Cong., 2d sess.), this office reported this inlet worthy of being improved to 18 feet depth at mean low water at a cost of $1,460,000, including cost of two ocean jetties if necessary, and covering a channel 500 feet wide outside between the jetties, 250 feet wide across the ocean bar, and 200 feet wide and 2.5 miles long from the bar to Sewalls Point; this work being considered worthy because of the value of the improved waterway as a harbor of refuge for medium-draft boats as well as because of its connection with future development of the adjoining inland waterways, and being recommended subject to a contribution of 10 per cent of the cost by local interests. At that time the division engineer suggested the possibility of greatly reducing the cost of the work by use of powerful dipper dredges adapted to this special work, whose first cost would be about $75,000, the rock on the bar being reported as mainly a combination of sand and fine shells, comparatively soft and easy to break up.

By special report, dated March 7, 1910 (S. Doc. No. 423, 61st Cong., 2d sess.), the river and harbor board furnished the Senate with information that a 12-foot depth opening across the bar could probably be obtained for $285,000, but reported against the 12-foot-depth inlet opening in view of the more useful 18-foot depth already recommended, and of a possible coastal waterway whose study was in progress.

Again, under date of January 20, 1912 (H. Doc. No. 471, 62d Cong., 2d sess.), this office reported favorably upon the improvement of this inlet to an 18-foot depth at mean low water, the estimate of the January 7, 1909, report being left unchanged—i. e., $1,460,000 as a maximum cost with a proviso for 10 per cent local contribution.

None of the projects nor estimates above reported have so far been adopted by Congress.

As it is now evident that a coastal canal of as much as 12 feet depth from this locality to some other ocean exit or inlet is not probable, and as there is still a demand for a harbor of refuge in this vicinity for medium-sized boats and an exit to the ocean from the existing inland waterways of this vicinity, the question of improving this inlet is again raised by the request of the river and harbor act of February 27, 1911, to which this report is a reply.

The district engineer in his report explains the urgent need of better transportation facilities for this neighborhood, but being limited by Congress to a consideration of merely 12 or 14 feet depth, he states his opinion that such depth over the ocean bar would not give the desired relief and a coastal canal would be preferable. The board of review under date of January 22, 1912, concurs with the district engineer officer, and refers to its prior reports (H. Docs. No. 1312, 60th Cong., 2d sess., and No. 471, 62d Cong., 2d sess.) in favor of an improvement to 18 feet depth.

After due consideration of the above-mentioned reports, I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors as stated in all the above-named reports, and I specially concur in the views of the division engineer as given in the report of January 7, 1909 (H. Doc. No. 1312, 60th Cong., 2d sess.), that it is quite possible that the cost of rock removal may be greatly reduced. No new facts are likely to be developed by further hearings or surveys, and so new estimates appear unnecessary. In view of the possibilities of securing a cut of 18 feet across the bar at much reduced cost by suitable dredging plant, using explosives only where actually necessary, and of the possibilities that such cut, even if of reduced width, may produce decided changes in the adjoining channels, it is considered worth while to experiment on this bar to the extent of about $300,000 for purchase or hire of plant and for dredging and rock removal, with a view to securing partial results which may be useful later here and elsewhere along this coast; and this much is recommended at present even if Congress does not desire at the present time to adopt the entire project.

I have therefore, in carrying out the instructions of Congress under the act of February 27, 1911, to report that in my opinion the improvement of St. Lucie Inlet, Fla., to 12 or 14 feet depth is not advisable at the present time except as a first step to a fuller developmen to an 18-foot improvement, as already recommended in House Document No. 1312, Sixtieth Congress, second session, and House Document No. 471, Sixty-second Congress, second session; but that an immediate expenditure of about $300,000 for excavating a cut of 18 feet center depth across the obstructing rock and the ocean bar is now advisable as a preliminary step to securing later the full project channel of 18 feet depth over at least 200 feet width from the ocean to Sewalls Point as described in House Document No. 1312, Sixtieth Congress, second session, at a cost possibly much less than the original estimate of $1,460,000.

Very respectfully,

W. H. Bixby,
Chief of Engineers, U. S. Army.

The Secretary of War.

The commerce for the year 1910, according to the best information obtainable, was about as follows:

Articles.	Amount in customary units.	Amount in short tons.	Valuation.
Fish	36,000 barrels	79,000	$720,000
Honey	10 carloads		30,000
Oranges	100,000 boxes		250,000
Pineapples	600,000 crates		1,200,000
Vegetables	2,000,000 crates		4,000,000
Miscellaneous fruits, naval stores, hides, etc		40,000	3,000,000
Fertilizer		50,000	4,500,000
Building material			
Groceries			
Dry goods			
Hardware			
Wines, etc			
Machinery			
Total		169,000	13,700,000

HARBOR AT ST. PETERSBURG, FLA.

The city of St. Petersburg is situated on the west shore of Tampa Bay, at a point about 30 miles distant from the entrance to the bay, as measured along the present ship channel. It is 21 miles from the city of Tampa and 8¾ miles from Port Tampa.

The water front of St. Petersburg is devoid of shelter from easterly winds. Tampa Bay is about 10 miles wide opposite this locality, and troublesome wave action occurs along this shore, caused by winds from easterly directions. In 1911 local interests excavated a channel leading directly shoreward from the bay into a basin excavated within the natural shore line near to and south of the southern corporate limits of the city. The channel is said to have been made 120 feet wide and 13 feet deep and the basin 450 feet wide, 1,360 feet long, and 14 feet deep. In its present condition the channel has a depth of 9 feet for a width of 75 feet, and the basin has a considerable area where depths of less than 10 feet are found. A least depth of 4 feet is found within the limits of the basin.

Bayboro Harbor, the local name for the basin before described, can accommodate vessels of 9 feet draft over a portion of its area. The wharves in front of the city can accommodate vessels drawing from 8 feet to 11 feet of water. These wharves can not be safely used during easterly storms.

The original project, which is also the existing project, was adopted by Congress July 25, 1912, and contemplates widening and deepening the channel entering Bayboro Harbor, so as to provide a depth of 10 feet and a width of 200 feet at the outer end, widening to 300 feet at the inner end, and protecting the channel by a jetty along the south side, at an estimated cost of $32,000 and $1,500 annually for maintenance; provided, that before improvement is begun satisfactory assurances will be given the Secretary of War that local interests will do all necessary work inshore of the east side of First Street, including the widening of the basin 175 feet and rounding off the corner at the entrance and the maintenance of the basin to a depth of 10 feet; and provided further, that the frontage on the basin acquired by the city will be moved northward 300 feet and the land along Salt Creek be reserved for future enlargements, the exact lines to be determined by the Chief of Engineers, United States Army.

There has been no expenditure under this project.

This project is based upon the reports contained in House Document No. 512, Sixty-second Congress, second session (with maps).

A report on a preliminary examination of this harbor may be found printed as House Document No. 148, Fifty-ninth Congress, first session (without maps).

There has been no modification of the existing project.

There have been no operations under this project.

The maximum draft that can be carried over the portion which it is proposed to improve is 9 feet.

The mean tidal range is 1.84 feet.

The length of channel which it is proposed to improve is about 2,900 feet.

As shown by the statistics accompanying the report on the preliminary examination, submitted June 5, 1911, the yearly commerce of this locality at that time amounted to 771,850 short tons. It consisted mostly of lumber, building and paving materials, fruits, naval stores, and general merchandise, aggregating in value $24,490,000.

It is proposed to apply the amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, for maintenance of the improvement when completed.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$1,500

SARASOTA BAY, FLA.

The west coast of Florida from a point about 10 miles south of the Anclote River to a point about 20 miles north of the Caloosahatchee River is bordered by keys separated from the mainland by sounds of very variable widths and depths, forming an intercoastal waterway along the coast. Sarasota Bay is the name given to that portion of waterway lying between Tampa Bay and Sarasota Pass. Under this heading is also included the improvement of Little Sarasota Bay, which is the name applied to that portion of the waterway lying between Sarasota Pass and Caseys Pass, opposite the town of Venice. The distance from Tampa Bay to Sarasota, opposite Sarasota Pass, is 20 miles, and the distance from Sarasota to Venice is 18 miles. Sarasota Bay varies in width from one-half mile to 3 miles, and Little Sarasota Bay from one-fourth to 1 mile.

Before improvement there was a navigable channel in Sarasota Bay with a least depth of 5 feet at mean low water, except at two shoals, where the depths were 4.3 and 3.5 feet, respectively. Little Sarasota Bay had a channel with a least depth of 1.2 feet at mean low water, except at one shoal which was bare at low water.

The original, which is also the existing, project was adopted in 1889 and provided for a channel 100 feet wide and 5 feet deep at mean low water from Tampa Bay to Sarasota at an estimated cost of $17,500. This project was modified in 1896 to provide also for a channel 75 feet wide and 3 feet deep from Sarasota, through Little Sarasota Bay, to Caseys Pass, the estimated cost of the modified project being $55,000, subsequently increased to $70,000, and again in 1911 to $95,000. The project was further modified by the river and harbor act of March 2, 1907, so as to provide for continuing the improvement to Venice, about 2 miles southeast of Caseys Pass.

This project is based upon House Document No. 61, Fifty-first Congress, first session (contains maps), also published in the Annual Report of the Chief of Engineers for 1890, pages 1615–1620.

The project is therefore to secure a channel 100 feet wide and 5 feet deep at mean low water from Tampa Bay to Sarasota, and a channel 75 feet wide and 3 feet deep at mean low water thence to Venice.

During the fiscal year ending June 30, 1912, Clambar Cut, Oyster Bar Cuts Nos. 1 and 2, section A of North Creek Cut, and a length of 2,000 feet of section B of North Creek Cut were dredged to a least depth of 3½ feet and width of 50 feet at a cost of $5,219.18.

There had been expended on the existing project up to June 30, 1912, $87,472.16.

The project is about 75 per cent completed. The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement is 5 feet between Tampa Bay and Sarasota and 2 feet between Sarasota and Venice.

The mean range of tide is 1.5 feet.

The distance from Tampa Bay to Sarasota is 20 miles, and from Sarasota to Venice is 18 miles.

The waterway is navigable its entire length of 38 miles.

The commerce for 1911 amounted to 35,811 short tons, valued at $1,589,393. It consisted principally of crate material, fertilizer, fish, fruit, merchandise, naval stores, and oysters. The commerce increased 73.7 per cent over that in 1910. Daily boat service is maintained between Sarasota and Tampa. One additional steamer was added to this line during the year. The improvement affords navigation facilities for a section heretofore undeveloped and which is now being rapidly settled and cultivated.

The improvement is the controlling factor in freight rates, and were it not available for purposes of navigation freight rates would be much higher.

It is proposed to apply the amount required for expenditure in fiscal year ending June 30, 1914, in furtherance of the project by dredging for the purpose of the extension of benefits.

Amount (estimated) required to be appropriated for completion of existing project	$12,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	13,000

TAMPA BAY, FLA.

This bay is located on the west coast of Florida. The distance from the entrance to the bay to its head at Gadsens Point is approximately 25 miles. The average width of the bay is about 7 miles. Gadsens Point is at the southern end of a peninsula, on both sides of which arms of the bay extend. The easterly arm is known as Hillsboro Bay and the westerly arm as Old Tampa Bay. At the head of Hillsboro Bay lies the city of Tampa, and on the eastern shore of Old Tampa Bay lies Port Tampa. Port Tampa is about 547 miles from New Orleans and 250 miles from Key West.

Before improvement the least depth between the Gulf of Mexico and Port Tampa was 13 feet.

The original project, adopted August 11, 1888, contemplated a channel 200 feet wide and 20 feet deep at mean low water from Tampa Bay to Old Tampa Bay. The estimated cost of this work was $63,000. Prior to this work was carried on in connection with improvement of Hillsboro Bay.

The total expenditure under this project was $130,000.

The existing project was adopted March 3, 1899. It provides for a channel 27 feet deep at mean low water from the Gulf of Mexico to Port Tampa, 500 feet wide across the bar and 300 feet wide in the bay, a channel of full width and 24 feet deep to be first secured and subsequently deepened. The estimated cost was $750,000.

This project was an item in the river and harbor act of March 3, 1899. The estimate of cost was subsequently prepared and was approved by the Secretary of War April 10, 1899.

This project was modified March 3, 1905, by Congress authorizing the Secertary of War to expend the balance remaining to the credit of this improvement in securing a channed 26 feet deep with sufficient width and by providing that no expenditure should be made until the owners of the terminals at Tampa Bay should by valid contract agree that the wharfage charges at such terminals should be submitted for approval to the Secretary of War. A schedule of such charges was approved by the Secretary of War on October 26, 1906.

The existing project is to secure a channel from the Gulf of Mexico to Port Tampa 26 feet deep at mean low water, 500 feet wide across the bar, and 300 feet wide in the bay.

No work was done on the improvement during the year. Expenditures were for contingencies.

The amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $635,172.16, of which amount $27,711.35 was applied to work of maintenance.

The project is completed. Shoaling has occurred in sections A, D, E, and K, amounting to about a foot, and in section F 1.6 feet.

The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement is 24.4 feet. The mean range of tide is 1.5 feet at the entrance and 2 feet at Port Tampa.

The distance from the entrance to the bay to Port Tampa is 35 miles.

Tampa Bay is navigable, in fact, over its entire area.

The commerce for the year 1911 amounted to 2,864,997 tons, valued at $49,343,589, consisting principally of cigars, coal, crude oil, fertilizers, fish, fuller's earth, lumber, naval stores, phosphate, tobacco leaf, fruit, and merchandise. Tampa Bay must be traversed by the water-borne commerce bound to and from Tampa, Port Tampa, St. Petersburg, points on Boca Ceiga Bay, Clearwater Harbor, Manatee River, and Sarasota Bay. Its commerce in reality is the combined commerce of all these points. Tampa is the general collecting and distributing center. (See also Hillsboro Bay.)

The improvement in connection with improved tributary waterways has lowered the freight rates for many points as much as 25 per cent. As tributary waterways are further improved these benefits will be further extended.

It is proposed to apply the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, to work of maintenance to make the full depth of the improvement available.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$9,000

CHANNEL FROM APALACHICOLA RIVER TO ST. ANDREWS BAY, FLA.

The proposed route of this canal extends a distance of approximately 32 miles, 4½ miles passing through Lake Wimico, with a ruling depth of 2½ feet; the other section, for about 27½ miles, passes through various creeks and short stretches of swamp and dry land, with no available depth in the creeks except at East Bay, which is an arm of St. Andrews Bay, where the ruling depth was 3½ feet. This forms an outlet for the Chattahoochee-Flint-Apalachicola-Chipola system of rivers, with a total navigable length of 470 miles.

The original and existing project adopted June 25, 1910, provides for a channel from Apalachicola River to St. Andrews Bay, Fla., by dredging a channel 65 feet wide and 5 feet deep by way of Lake Wimico, Searcy Creek, and the south prong of Wetappo Creek, at an estimated cost of $450,000, in accordance with report printed in House Document No. 670, Sixty-first Congress, second session. No maps.

No modification has been made in the existing project since its adoption by Congress.

Work was carried on during a part of the fiscal year under contract on the western end of the improvement, and by Government plant and hired labor on the eastern end when plant was available. Very poor progress was made by the contractor.

The contract was terminated on January 22, 1912, and the U. S. dredge *Blackwater* placed on the improvement March 4, 1912. The total length of channel completed, including portions of creeks where no dredging was required, was 9 miles. The amount expended during the fiscal year was $110,482.13, all for improvement.

The amount expended on this work to the close of the fiscal year ending June 30, 1912, was $131,833.01, all for improvement.

Up to June 30, 1912, the project was about 40 per cent completed. The project depth and width throughout the portion completed was obtained.

The improvement is not available for commerce until completed.

Until the improvement is available for commerce the effect on freight rates can not be determined.

It is proposed to apply the available funds and those recommended in dredging operations in prosecution of the project.

Amount (estimated) required to be appropriated for completion of existing project	$130,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	130,000

APALACHICOLA RIVER, FLA., INCLUDING THE CUT-OFF, LEE SLOUGH, LOWER CHIPOLA RIVER, AND THE UPPER CHIPOLA RIVER FROM MARIANNA TO ITS MOUTH.

(*a*) *Apalachicola River, the Cut-off, Lee Slough, and lower Chipola River.*—From the junction of the Chattahoochee and Flint Rivers to the Gulf of Mexico (Apalachicola Bay) the Apalachicola

River has a length of about 137 miles and a low-water slope of about 3 inches to the mile. The general direction of flow is southwesterly. The width varies from 150 to 300 yards and the available depth was originally 6 feet at low water, except where obstructed by snags and sunken logs.

The Confederate authorities obstructed the channel at a point about 47 miles above the mouth, causing the river to break through by a channel known as Moccasin Slough into the River Styx, the latter a tributary entering the Apalachicola a few miles below the Confederate obstructions. Moccasin Slough was very narrow and tortuous and much obstructed by logs, snags, etc., and the former channel has gradually filled up.

About 55 miles above the mouth steamboats may leave the river, and, after passing through the Cut-off, lower Chipola River, and Lee Slough, reenter it about 17 miles farther down, thus making many landings of much greater importance than those upon the corresponding part of the main river, which includes Moccasin Slough, above mentioned.

The original project adopted by the act of June 23, 1874, contemplated securing a channel 100 feet wide and 6 feet deep at low water by the removal of snags and overhanging trees and widening and straightening Moccasin Slough and the Elbows, at an estimated cost of $80,333.

The act of July 13, 1892, adopted an addition to the project providing for the clearing of a channel 60 feet wide and 5 feet deep through the Cut-off, Lee Slough, and the lower Chipola River, at a cost of $7,500.

The existing project adopted by Congress June 23, 1874, and July 13, 1892, provides for securing a channel 100 feet wide and 6 feet deep at low water in the Apalachicola River, widening and straightening Moccasin Slough and the Elbows; also for a channel 60 feet wide and 5 feet deep through the Cut-off, Lee Slough, and lower Chipola River. The estimate of cost for the combined projects was $87,833.

The existing project for Apalachicola River, Moccasin Slough, and the Elbows is based on report printed in Annual Report of the Chief of Engineers for 1873, page 698. No maps.

The existing project for the Cut-off, Lee Slough, and lower Chipola River is based on report printed in Annual Report of the Chief of Engineers for 1889, page 1416. Contains maps.

Operations during the fiscal year ending June 30, 1912, were carried on in the Apalachicola River, Cut-off, Lee Slough, and lower Chipola River in snagging and dredging, the amount expended being $5,245.19, all for maintenance.

The amount expended on work under this project since 1874 to the close of the fiscal year ending June 30, 1912, was $122,633.47. About $45,000 was expended in maintenance. In addition there was expended between 1828 and 1831, $13,000, for which no project is of record.

The project is about 96 per cent completed.

The expenditures made have improved Moccasin Slough sufficiently for present purposes and maintained the river reasonably free from snags and other obstructions and enabled steamboats to make use of the Cut-off, lower Chipola River, and Lee Slough either by day or night. An available depth of 6 feet has been secured in the Apalachicola River, except at Blountstown Bar, where the depth is but 3 feet, and 5 feet in the Cut-off, lower Chipola River, and Lee Slough. The Cut-off and Lee Slough have been widened also at the narrowest places so that steamboats can pass through readily going downstream and can pass upstream with little difficulty, but the channel in Lee Slough is still very crooked, with some sharp bends that require easing, and the steamboats prefer the main river on the up trip.

The work was done with the plant belonging to the Chattahoochee and Flint River improvements, and comprised cutting overhanging timber, removing snags and logs, blasting out cypress stumps, and widening the slough and Cut-off by clearing the points of timber and dredging them off, depositing the dredged material in the deep holes or upon the banks.

Variation at the water level is from 0 to 30 feet at Chattahoochee River bridge.

This river is navigable throughout its entire length of 137 miles.

The commerce of the river consists chiefly of cotton, naval stores, general merchandise, saw logs, and timber for export, and is so combined with that of the Chattahoochee, Flint, and upper Chipola Rivers that a separation is impossible. The commerce of all these streams has increased from about $4,000,000 in 1899 to $15,780,029 in 1911. For detailed statistics see report on Flint River improvement.

As the country bordering on the Apalachicola River is largely dependent upon the river for the transportation of its supplies and products, this improvement is essential to the development of this section.

It is proposed to apply the available balance and the funds recommended to maintenance of Apalachicola River proper by removing annual accumulation of snags, and to continue straightening and widening the Cut-off, Lee Slough, and lower Chipola River to make the improvement available.

(*b*) *Upper Chipola River, Fla., from Marianna to its mouth.*—The river from Marianna to the head of the Dead Lakes has a general low-water depth of 5 feet and width varying from 60 to 200 feet, but is greatly obstructed by rock shoals, snags, and overhanging trees. Three bridges also form obstructions, their headways above low water being 17, 16, and 15 feet, respectively.

At Look and Tremble Shoal, about 45 miles above the Dead Lakes, there is a fall of 5 feet in 40 over rock bottom. At Sister Islands, between this shoal and the Dead Lakes, the main channel of the river is very tortuous and obstructed by mud bars over which there is less than 2 feet at low water. The channel through the Dead Lakes, which is considered part of this improvement, has plenty of water, but was obstructed by snags and large cypress stumps and trees.

The river rises in Jackson County, Fla., flows in a general southeasterly direction, and has a length of about 125 miles. The length under improvement is estimated at 105 miles.

The original and existing project, adopted by act of March 3, 1899, provides for clearing a low-water channel 3 feet deep and 60 feet wide from Marianna to the foot of the Dead Lakes, estimated to cost $41,000, exclusive of necessary plant, which would comprise a snagboat, drilling barge, and dump scow.

No change has been made in this project since its adoption by Congress.

The existing project for the upper Chipola River is based on report printed in Annual Report of the Chief of Engineers for 1889, page 1416. Contains maps.

The work done during the fiscal year ending June 30, 1912, consisted in dredging and in the removal of snags and stumps. All work was confined to the section below Look and Tremble Shoal. The amount expended during the year was $1,574.40. All work done was for maintenance.

The amount expended on this project up to the close of the fiscal year ending June 30, 1912, was $23,252.17, of which about $10,000 has been applied to maintenance. About 55 per cent of the project is completed.

In 1904 $5,000 was applied to the river above Sister Islands. Snags, logs, and overhanging trees were removed, and a channel blasted through the rock reefs from Marianna to Look and Tremble Shoal; wing dams were built below some of the shoals, and below Look and Tremble Shoal, down as far as Sister Islands, snags, logs, and overhanging timber were removed, as well as available funds permitted. From the lower end of the Dead Lakes for a distance of 35 miles a channel 60 feet wide was cleared of obstructions by removing logs, overhanging trees, cypress stumps, and knees. During the year snagging was confined to the lower end of the Dead Lakes. Very little benefit has been derived from the expenditure above Look and Tremble Shoal, except to timber industry, but the work done below the shoal and in the Dead Lakes has been of great benefit, as there are many turpentine stills below this shoal, giving a considerable commerce on this portion of the river, and in the Dead Lakes a large commerce in towing logs.

Three feet is the maximum depth at low water over the shoalest part of the river below Look and Tremble Shoal. The actual head of navigation at ordinary low water is Braxtons Landing, 40 miles above the foot of the Dead Lakes. The river is in fair condition to Look and Tremble Shoal.

The variation of the water level is 0 to 14 feet.

The commerce of this stream consists principally of naval stores, round and square timber, lumber, and other miscellaneous freights, the value of which is included in the combined commerce reported under Flint River improvement.

The territory through which the stream flows is heavily timbered with long-leaf yellow pine and cypress, which is now being rafted down this stream in large quantities.

The section of country below Look and Tremble Shoal has no railroads, and depends largely upon this river, the reduction in freight rates being the lessened haul to river as compared to Apalachicola River or railroads to the north and west.

It is proposed to apply the available balance and the funds recommended to dredging and regulation of channel and to removal of snags and overhanging trees from Look and Tremble Shoal to the foot of Dead Lakes. This work is necessary to make the improvement available.

Consolidated.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement ---------------------------- $7,000

CALOOSAHATCHEE RIVER, FLA., BETWEEN PUNTARASA AND FORT THOMPSON.

The Caloosahatchee River rises in Lake Okechobee and flows in a westerly direction, emptying into the Gulf of Mexico at Puntarasa, Fla. The distance from the lake to the gulf is 81 miles. Before improvement there was a navigable channel with a least depth of 5 feet at mean low water from Puntarasa to Fort Myers, and a channel with a least depth of 3.5 feet from Fort Myers to Fort Thompson. Above Fort Thompson the river was obstructed by snags and overhanging trees. Previous projects have involved work from Puntarasa to Fort Thompson, a distance of 59½ miles. The distance from Puntarasa to Fort Myers is 21½ miles.

The original project, adopted in 1882 and modified in 1886 and 1888, provided for a channel 100 feet wide and 7 feet deep at mean low water from the mouth to Fort Myers, for a channel 4 feet deep at mean low water across the shoal at Beautiful Island, and for snagging and cutting trees on the upper river.

The project, as modified, was completed in 1901, at a total cost of $33,600. Maintenance work has been required from time to time since. Up to the end of the fiscal year ending June 30, 1912, $16,901.05 had been expended for maintenance of the upper river.

The existing project, adopted by the river and harbor act of June 25, 1910, provides, in accordance with plans printed in Rivers and Harbors Committee Document No. 8, Sixty-first Congress, second session (no map), for a channel 200 feet wide and 12 feet deep over the bar at the entrance below Puntarasa and 100 feet wide and 10 feet deep thence to Fort Myers, with a turning basin at that point, at an estimated cost of $119,000, with $2,000 annually for maintenance.

The total expenditure during the fiscal year ending June 30, 1912, was $48,147.62.

The amount expended on work under the existing project up to the close of the fiscal year ending June 30, 1912, was $112,668.63. None of this amount was applied to maintenance of improvement.

This project was 95 per cent completed on June 30, 1912. The channel is now available for use to Fort Myers. The maximum draft that could be carried June 30, 1912, over the shoalest part of the locality under improvement below Fort Myers was 9 feet and between Fort Myers and Fort Thompson 4 feet.

The mean range of tide in the lower river is 1.6 feet. Freshets cause the upper river to rise as much as 12 feet above mean low stage.

The stream is navigable, in fact, through Lake Okechobee and the Kissimmee River to the town of Kissimmee, a distance of 309 miles above the entrance. Fort Thompson is 59½ miles above the mouth.

The commerce for the year 1911 consisted in cattle, cigars, crate material, crude petroleum, fish, hogs, lumber, merchandise, naval stores, oranges, fruit, and vegetables. The tonnage for the year amounted to 89,009 net tons, valued at $3,880,596, being an increase in tons over the preceding year of 134 per cent. The cause of this increase is threefold—dredging in the Caloosahatchee River, dredging in the Everglades, and large land sales between Fort Myers and the lake. The large increase may not hold after the dredging operations are completed in the future, but the heavy settlement of the surrounding country indicates a continued healthy growth.

There is one steamer line giving regular daily service down the river and one line giving regular daily service up the river, with a rate per ton mile of 6⅔ cents on general merchandise. With the exception of the Towles Line to Key West, the other many boats are private. There are in all about 15 boats that can be said to be regular boats, and in addition there are 56 boats in the fish trade.

No lines were abandoned during the year. Two lines enlarged their service, and the Towles Line to Key West extended its service to Fort Myers as soon as the dredged channel permitted.

The improvement has had no effect on freight rates, and as the river does not parallel the railroad it probably will not. No railroad serves the territory adjacent to the river above or below Fort Myers, and all the produce from this territory and supplies for it must, therefore, be handled on this river. The river is therefore an important factor and distributor for the railroad at Fort Myers and also forms a comparatively easy outlet for the country adjacent to Lake Okechobee. The several prosperous little towns on the Caloosahatchee River, and likewise the lower islands and towns on the southern Gulf coast, are absolutely dependent upon the river as a means of obtaining their supplies from Fort Myers and as a means of getting their produce to Fort Myers for shipment to other markets.

It is proposed to apply the amount required for expenditure in fiscal year ending June 30, 1914, to maintenance work by dredging.

July 1, 1912, amount covered by uncompleted contracts	$6,348.82
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	2,000.00

CRYSTAL RIVER, FLA.

This river rises near the town of Crystal River, Fla., and is formed by several springs. It flows in a westerly direction and empties into the Gulf of Mexico. The length of the river is 9 miles. Before improvement the channel from the Gulf of Mexico to the town of Crystal River was tortuous and shallow, the least depth being 2.7 feet at mean low water of the gulf. The entrance to the river was obstructed by reefs and sand bars.

The project, adopted June 13, 1902, which is the existing project, contemplates a channel 60 feet wide and 6 feet deep at mean low water of the gulf from the Gulf of Mexico to the town of Crystal River. The estimated cost was $84,647.46.

The project is based upon the report contained in House Document No. 386, Fifty-sixth Congress, first session (with maps).

No modification has been made in the existing project.

Dredging for maintenance, which began June 26, 1911, was completed on July 1, 1911. This work on the first day of the year was the only work done during the year and resulted in restoring to full depth and width a cut 100 feet in length.

The expenditures during the year amounted to $2,000.

The amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $30,431.72, of which $5,225 was applied to maintenance of improvement.

The project is completed.

The maximum draft that could be carried June 30, 1912, over the shoalest part of the locality under improvement was 6 feet at mean low water.

The mean range of tide is 2.3 feet.

The river is navigable in fact from the entrance to the town of Crystal River, a distance of 9 miles.

The commerce for 1911 amounted to 5,192 short tons, valued at $253,700, and consisted principally of cedar logs, fish, ice, merchandise, and oysters. The increase in tonnage over the preceding year amounted to 148.9 per cent. This increase was due to the resumption of operations of a pencil mill, the cedar logs for this mill forming nearly four-fifths of the total commerce on the river. The improvement has had no effect on freight rates, which are very high.

It is proposed to use the amount estimated as required for expenditure during the fiscal year ending June 30, 1914, in maintaining the improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$2,000

HOLMES RIVER, FLA., FROM VERNON TO ITS MOUTH.

Holmes River empties into the Choctawhatchee River about 40 miles above the mouth of the latter. It is a wide and deep stream to the town of Vernon, 25 miles above its mouth, but was originally obstructed by sunken logs, fallen timber, and overhanging trees, and only available for navigation by small sailing craft and barges, which occasionally made trips up to Vernon.

The source of this stream is in the southern part of Alabama, the general direction of flow is southerly, the river emptying into the Choctawhatchee River. Its length is about 160 miles, of which about 25 miles is under improvement.

The original and existing project, adopted August 11, 1888, for the improvement of the stream provides for making a navigable channel by removing logs and snags from the river and overhanging trees from its banks from the mouth up to the town of Vernon.

No modification has been made since adoption by Congress.

Operations during the fiscal year ending June 30, 1912, consisted in maintaining the improvement by removal of obstructions and deepening the channel over Boyington Bar, 4 miles above the mouth, at a total cost of $2,032.25, of which $1,400 was for maintenance.

The total amount expended on this improvement up to the close of the fiscal year ending June 30, 1912, was $20,812.30, of which $18,651.50 was upon Holmes River and $2,160.80 upon Lagrange Bayou.

The project has been completed and additional work required is for maintenance. No increased depth secured; variation of water surface, 0, or low water, to 6 feet above.

The importance of this improvement has greatly increased in the last few years, and several steamers are now engaged in the large and growing trade between Vernon and Pensacola.

The commerce of the stream consists of cotton, turpentine, rosin, molasses, honey, and miscellaneous articles, the annual value of which in 1911 is estimated at $850,000.

As this river is the only means of transportation in that section, there is no basis for comparison, and the effect of the improvement on freight rates can not be stated.

It is proposed to apply the balance available and funds recommended in maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$2,500

INDIAN RIVER, FLA.

Indian River is a shallow sheet of water on the east coast of Florida, lying between the mainland and the keys bordering the coast and extending from a point a slight distance north of Titusville to Jupiter Inlet, a distance of approximately 140 miles. It has an average width of about a mile and a half. It is not, accurately speaking, a river, but rather a tidal sound. It forms a part of the system of intracoastal canals along the eastern coast of Florida. Before improvement the ruling depth was 2½ feet.

The original project, which is the existing project, was adopted in 1891 and provides for a continuous channel between Goat Creek and Jupiter Inlet 5 feet deep at mean low water and at least 75 feet wide in the straight reaches, with as much greater width as may be required in the turns. The estimated cost is $44,000. Under date of July 11, 1911, the estimated cost was increased $20,000, making a total estimated cost of $64,000. The project is based upon the report printed in House Document No. 168, Fifty-first Congress, second session (no maps).

No modification has been made of the existing project.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, including expenditures on Jupiter Inlet, $3,127.15, was $76,031.72, of which $39,973.60 was for work of maintenance. No modification has ever been made in the original project.

During the year a channel 35 feet wide, 5 feet deep, and 7,450 feet long was dredged between Great Pocket and Pecks Lake, and a channel 5 feet deep, 50 feet wide, and 650 feet long was also dredged through a shoal at the entrance to Great Pocket. The total cost of this work was $13,550.47. This work most probably comes under the head of maintenance.

The project is about 60 per cent completed. As a result of the work done the project has been completed from Goat Creek to St. Lucie Inlet, a distance of 51 miles, and a portion of the projected work has been done between St. Lucie Inlet and Jupiter Inlet, a distance of 16 miles. St. Lucie Inlet is the result of an artificial opening made into the ocean in 1892 after the project for this improvement was adopted. The inlet widened under natural influences and caused the sound inside to so fill with sand that the channel has been at times obliterated, and attempts at maintenance have been unsuccessful. To obviate these conditions the channel between Great Pocket and Pecks Lake was dug.

The maximum draft that can be carried over the shoalest part of the locality under improvement is 4 feet, in the vicinity of St. Lucie Inlet.

The range of tide in the vicinity of the inlets is 2 feet; elsewhere the tide is negligible. The water surface is raised or lowered by strong winds as much as 3 feet, irrespective of the tide.

The distance between Goat Creek and Jupiter Inlet is 77 miles.

The commerce of this locality consists mainly of fruits, vegetables, fish fertilizers, gasoline, crate material, hay, grain, lumber, and general merchandise. In 1911 it amounted to 11,593 short tons, valued at $609,734.

So far as has been ascertained, the improvement has had no effect on freight rates.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied to continuing work under the project and in maintenance of channel already dredged. The work proposed is for the purpose of extension of benefits.

Amount (estimated) required to be appropriated for completion of existing project	$20,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	22,000

MANATEE RIVER, FLA.

The river rises in the western part of the central portion of the peninsula of Florida and empties into the southern part of Tampa Bay. Its length is about 50 miles and its general direction of flow is westerly.

For a distance of 13 miles above the mouth the river is a tidal estuary from one-half mile to 1 mile in width. From the head of the estuary to Rye the width varies from 80 feet to 600 feet. The original channel width was indeterminate, but was in places not more than 50 feet for the available depths given.

In its original condition this river had an available channel 6 feet deep to Palmetto, 6½ miles above the mouth; 3 feet deep to Ellenton, 10 miles above the mouth; and 1½ feet deep to Rye, 24 miles above the mouth.

The plane of reference for the lower river is mean low water and for the upper river mean low stage.

The river is under improvement for a length of 22 miles, measured from its mouth.

The original project was adopted in 1882 and contemplated a channel 100 feet wide and 13 feet deep from Tampa Bay to Shaw and McNeills Points. This project was modified in 1886 so as to provide for a channel 100 feet wide and 8 feet deep to Manatee and in 1897 to provide for a cut-off into Terriceia Bay.

The amount expended on original and modified projects prior to operations on existing project was $69,350.80, of which amount the sum of $15,643.20 was applied to maintenance.

The existing project provides for a channel 100 feet wide and 13 feet deep from Tampa Bay to McNeills Point, 100 feet wide and 9 feet deep to Rocky Bluff, and 75 feet wide and 4 feet deep to Rye; also a cut-off channel, 100 feet wide and 6 feet deep, from the river into Terriceia Bay, at an estimated cost of $130,520. This project was adopted by Congress March 2, 1907, and in its present condition is based upon report published in House Document No. 117, Fifty-eighth Congress, second session.

The total expended on existing project to June 30, 1912, was $80,710, of which amount the sum of $10,000 was applied to maintenance.

The approved project is about 65 per cent completed. Excepting the channel at the entrance, all the work contemplated has been completed.

The result of the work accomplished has been to make the channel less tortuous and to increase the available depth to Rock Bluff 3 feet and to Rye 1½ feet. Maintenance work is required to restore the depth of 4 feet to Rye. The maximum draft that could be carried June 30, 1912, is 9 feet to Rocky Bluff, and 3 feet to Rye.

The lengths of the improved sections of the river are 12 miles from the mouth to Rocky Bluff and 12 miles from Rocky Bluff to Rye, 24 miles in all.

The head of navigation is the bridge at Rye, 24 miles above the mouth.

The commerce during the calendar year 1911 amounted to 63,607 short tons. It consisted mostly of celery, Fuller's earth, merchandise, naval stores, oranges, sand and shell, tomatoes, and other vegetables. The total value was $3,019,790. The commerce increased 75.5 per cent over the previous year. The increase is largely due to the improvement, which has contributed to the growth of the community. There was a very material increase in the vegetable crop of the year.

The improvement of this stream is the controlling factor in the regulation of freight rates.

It is proposed to apply the amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, to maintenance work where most needed for the purpose of making the improvement available.

Amount required for expenditure in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

ORANGE RIVER, FLA.

This stream rises in the swamps in the northern part of Lee County, Fla., and empties into the Caloosahatchee River about 24 miles above its mouth. Orange River is about 12 miles long. Its general direction of flow is northwesterly.

The section included in the project is 5.6 miles long and extends from the mouth to Buckingham.

In its original condition this section was obstructed by snags and overhanging trees and afforded a depth of 1.5 feet for a distance of about 6 miles above the mouth.

The available channel in its original condition was only about 30 feet wide.

The plane of reference is mean low water. Tidal effect is perceptible at the head of navigation.

The original project, which is also the existing project, was adopted by Congress June 13, 1902, and provides for a channel 50 feet wide and 4 feet deep from the mouth to the head of navigation. The estimated cost was $2,500. This project is based upon the report contained in House Document No. 318, Fifty-sixth Congress, first session. This document does not contain a map.

No modification has been made to the existing project.

There were no operations during the year and no expenditures were made.

The amount expended on existing project to the close of the fiscal year ending June 30, 1912, was $6,100, of which amount $4,100 was applied to maintenance.

The project has been 80 per cent completed. The result of the work done has been to clear the river of obstructions, so that a navigable channel 50 feet wide and 4 feet deep exists from the mouth to the head of navigation, excepting one place in the upper portion, where the river banks are only 40 feet apart.

The maximum draft that can be carried June 30, 1912, is 4 feet over the shoalest part under improvement.

The usual variation of the water surface due to freshets is 2 feet.

The length of the improved section of the river is 5.6 miles.

The head of navigation is the iron bridge at Buckingham, 5.6 miles above the mouth.

The commerce during the calendar year 1911 amounted to 5,390 short tons. It consisted mostly of fertilizers, general merchandise, oranges, grape fruit, and vegetables, of a total value of $281,650.

The improvement has caused a material increase in the development of the adjacent territory.

As there were no established freight rates prior to the improvement, no change can be noted.

It is proposed to apply the amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, to work of maintenance to make the improvement available.

Amount that can profitably be expended in fiscal year ending June 30, 1914, for maintenance of improvement	$1,000

THE ST. JOHN RIVER, FLA., JACKSONVILLE TO THE OCEAN.

This work includes the improvement of the bar at the river mouth and the improvement of the channel from the bar to Jacksonville, a distance of 27.5 miles. The entrance to this river is 21.7 statute miles from the entrance to Fernandina Harbor, Fla., and 122 statute miles from the entrance to Savannah River, Ga. Before improvement there was a varying channel across the bar, sometimes 5, sometimes 7 feet deep, shifting in location through a north and south range of 1 mile. Between the bar and Jacksonville the channel had a least mean low-water depth (at Dames Point) of 11.5 feet and was about 150 feet wide.

The range of tide is 5.22 feet at the bar, 4.3 feet at Mayport, 1.8 feet at Dames Point, and 0.8 foot at Jacksonville.

The original project for improvement, adopted in 1879, contemplated a channel 15 feet deep at mean low water over the bar. This was to be obtained by dredging and building training walls in the river and by building two stone jetties, converging upon the bar, 1,600 feet apart at their outer ends. Under this project the sum of

$1,417,000 was expended. As a result the bar channel was fixed and deepened to 13 feet.

When the permanent increase in depth over the bar had been secured, a project was submitted in 1892 contemplating securing a channel 18 feet deep at mean low water from the bar to Jacksonville. This project was carried through by the War Department with funds furnished by the county of Duval. It was completed in 1894. In 1896 a project was adopted providing for a channel from Jacksonville to the ocean 24 feet deep at mean low water and 300 feet wide.

The amount expended on original and modified projects prior to operations on existing project was $3,994,394.89, of which $175,175.99 was for construction of a seagoing dredge and $543,398.52 was for work of maintenance.

With the expenditure for work of maintenance the work of restoring the jetties to their original heights was completed, excepting the middle portion of the north jetty, which is below its effective height, and the channel through Mile Point Cut, White Shells Cut, Fulton Cut, Clapboard Creek Cut, and St. Charles Creek Cut was restored to the original depth of 24 feet for a least width of 150 feet. During the course of maintenance dredging in St. Charles Creek Cut was done to a depth of 30 feet, as called for under the new project. The project was nearly completed, and contracts were in force under it when the existing project was adopted.

The existing project was adopted by the river and harbor act of June 25, 1910, and provides for a channel 30 feet deep and 300 feet wide from Jacksonville to the ocean, following generally the lines of the 24-foot channel, increasing in width to as much as 600 feet at the bends and through the jetties, as outlined in House Document No. 611, Sixty-first Congress, second session (with maps). The total estimated cost of the work is $2,852,000, which includes the widening of the channel opposite Mayport to 800 feet in excess of the channel width to a depth of 27 feet, to provide an anchorage basin for vessels awaiting favorable weather.

The sum of $669,157.47 was expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, of which amount the sum of $118,468.34 was for maintenance; and the sum of $296.40 was received from sales, and $41,502.76 was received for rent of dredges *St. Johns* and *Jacksonville*.

The work in progress is under continuing-contract appropriations. The balance of the authorization remaining to be appropriated is $150,000.

The existing project was about 23 per cent completed on June 30, 1912. The maximum draft that can be carried at mean low water is 21 feet, shoaling having occurred in Fulton and Brown Creek cuts to this extent. The mean rise of the tide at Fulton cut is 2.9 feet and at Browns Creek cut is 2.8 feet. Some shoaling has also occurred in the Mayport, New Berlin, and Dames Point cuts, reducing the depths in these cuts to 23.2, 22.7, and 23.7 feet, respectively.

The commerce for the fiscal year 1911 amounted to 1,790,498 short tons, valued at $56,865,789, consisting of coal, cement, fertilizers, fertilizer materials, fruits, lumber, merchandise, phosphate, oils, steel rails, vegetables, etc. The increase in tonnage over the preceding year amounted to only 1.5 per cent. One steamer line was established during the year, an intracoastal line to Fort Pierce, and one line was abandoned, the Roome Line to Miami.

The post-office receipts during 1911 were $476,299.27 and the bank clearings $146,740,819.23.

Were it not for the improvement, freight rates from Florida to northern points would be 50 per cent greater than they are.

The work on previous projects has resulted in establishing favorable rates for this port, which permit it to reach far into the Middle West. In its incomplete state the present project can not be said to have had any effect on freight rates nor on the establishment of new business, though in anticipation of deeper water the farseeing men in the city are striving to have adequate terminals to handle the large business which is expected with the completion of the project.

It is proposed to utilize the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914 ($700,000), in entering into a contract for the completion of the rock removal from Trout Creek cut, utilizing the rock for the construction of training walls and shore protection; in entering into contract for removal of rock from Dames Point; in entering into a contract for dredging between Jacksonville and Dames Point; in continuing the operation of Government plant in the lower portion of the river and in maintenance of the jetties. The growing commerce of this port and the constantly increasing draft of ships loading or desiring to load at this port makes it of the utmost importance that the 30-foot channel be completed not later than July 1, 1915, and the above estimate is submitted with this end in view. These funds are necessary in order to permit the execution of advantageous contracts for completing the remainder of the work to be done by contract and to provide for the operation of the Government plant until June 30, 1914. These expenditures are necessary in order to make the improvement available.

July 1, 1912, balance available	$26,018.09
Amount appropriated by river and harbor act approved July 25, 1912	300,000.00
Amount appropriated by sundry civil act approved Aug. 24, 1912	350,000.00
Amount available for fiscal year ending June 30, 1913	676,018.09
July 1, 1912, amount covered by uncompleted contracts	460,358.65
Amount of continuing-contract authorization, act of Feb. 27, 1911	500,000.00
Amount appropriated under such authorization	350,000.00
Amount yet to be appropriated	150,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1]1,477,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1,2]700,000.00

ST. JOHNS RIVER, FLA., JACKSONVILLE TO PALATKA.

This improvement previous to the passage of the river and harbor act of June 25, 1910, was reported upon under the title, "Improvement of St. Johns River at Orange Mills Flats, Fla."

For general description of the St. John River, see Annual Report of the Chief of Engineers for 1912, page 524.

The length of this section of the river is 55 miles.

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[1] Exclusive of amount available for fiscal year 1913.

[2] Of this amount, $150,000 is for continuing-contract work authorized by the act of 1911.

Before improvement there were four shoals between Tocoi and Palatka. These were Tocoi Shoal, with a least depth of 11.1 feet; Racy Point Shoal, with a least depth of 9.8 feet; and Forresters Point Shoal, with a least depth of 11.6 feet.

The original project, which is likewise the existing project, was adopted March 3, 1899, and contemplated dredging a channel 200 feet wide and 13 feet deep through the shoals named, at an estimated cost (increased in 1906) of $185,000. This project is based upon a report of an examination and survey printed in House Document No. 523, Fifty-fifth Congress, second session. (No maps.)

No modification has been made in the existing project.

The amount expended during the fiscal year amounted to $2,488.96, which was used in redredging the channel through Tocoi Shoal, where shoaling had occurred. A cut 60 feet wide and 9,590 feet long was completed to a depth of 15 feet.

The amount expended on the work of the existing project up to the close of the fiscal year ending June 30, 1912, was $164,040, of which amount $13,779.75 was for work of maintenance.

The project was 80 per cent completed at the close of the fiscal year. The work done has been of material benefit to navigation.

The maximum draft that could be carried over the shoalest part of the improvement June 30, 1912, was 13 feet. The widths of the 13-foot channels through the shoals are as follows:

	Feet.
Tocoi Shoals	110
Racy Point Shoal	180
Orange Mills Flats	200
Forresters Point Shoal	160

The usual variation of level of water surface due to freshets is 3 feet. The mean range of tide is 0.9 foot.

The distance from Jacksonville to Palatka is 55 miles.

The river is navigable to Lake Washington, a distance of 276 miles. The head of steamboat navigation at present is Lake Poinsett, 252 miles from the mouth of the river.

The existence of the St. Johns waterway has probably had an important effect in keeping down freight rates, but the increase of the channel to 13 feet has not, as far as known, caused any changes in rates.

This channel, however, permits light-draft schooners to load at Palatka with cypress lumber from the large mills at that place, and a diminution in depth in the channel, requiring lightering of this material to Jacksonville, would, it is thought, raise the freight rates.

The commerce for the year amounted to 198,293 short tons, valued at $7,636,633, consisting principally of crate material, fertilizers, fruit, grain, groceries, logs, lumber, merchandise, naval stores, and vegetables. The commerce increased 19.3 per cent during the year.

It is proposed to apply the amount required for expenditure in fiscal year ending June 30, 1914, to dredging in furtherance of existing project and for maintenance.

The proposed work is for extending the benefits.

Amount (estimated) required to be appropriated for completion of existing project	$17,600
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvements and for maintenance	19,600

ST. JOHNS RIVER, FLA., PALATKA TO LAKE HARNEY.

For general description of the St. Johns River, see Annual Report of the Chief of Engineers for 1912, page 524. The length of this section of the river is 115 miles. Palatka, at the lower end of this section, is 83 miles from the mouth of the river. Before improvement there was a shifting channel through Volusia Bar with depths of from 3.5 to 4.5 feet at mean low-water stages. A number of sharp bends also made navigation difficult.

Prior to the passage of the river and harbor act of June 25, 1910, only that portion of this stretch of river between Lake George and Lake Monroe was under improvement and this improvement was reported upon under the title "Improvement of Volusia Bar, Fla." The original project for this improvement, adopted in 1879 and modified in 1887, provided for the construction of two converging jetties and for dredging at Volusia Bar, in order to secure a depth of 5 feet at mean low water at an estimated cost of $25,000.

The project was completed in 1887, and additional work required is for maintenance. As shoaling has continued, it has been found necessary to dredge from time to time in order to maintain the required depth.

The total amount expended on the original and modified projects was $50,838, of which $25,838 was for work of maintenance.

The existing project, adopted by the river and harbor act of June 25, 1910, contemplates securing a channel 8 feet deep and 100 feet wide from Palatka to Sanford, and 5 feet deep and 100 feet wide from Sanford to Lake Harney, in accordance with the report published in House Document No. 1111, Sixtieth Congress, second session, at an estimated cost of $129,600, with $6,000 annually for maintenance. (Contains maps.)

No modification has been made in the existing project.

During the year cut-off channels 10 feet deep and 110 feet wide were dredged at Florida and Coxetters Bends, 960 and 990 feet long, respectively. Channels of the dimensions given were also dredged through the shoals enumerated below:

Location of shoal	Depth of dredged channel.	Width.	Length.
	Feet.	*Feet.*	*Feet.*
Fort Florida, 184 miles above Palatka	10	110	1,800
Lake Monroe, upper bar, 94 miles above Palatka	10	110	1,900
Geneva Ferry, lower shoal, 4.9 miles above Sanford	6	110	970
Geneva Ferry, upper shoal, 5.1 miles above Sanford	6	110	1,300
Geigers Shoal, 10.6 miles above Sanford	6	110	1,300
Lemon Bluff, 13 miles above Sanford	6	110	1,100
Lake Harney, lower bar, 21.9 miles above Sanford	5.2	110	2,700

Between the upper and lower bar or shoals at Geneva Ferry a cut-off 6 feet deep and 100 feet wide was dredged across the sharp bend leading through Lake Jessup, by Orange County, incident to the construction of a bridge at Geneva Ferry, with the approval of the War Department.

Snagging operations were carried on by the U. S. power boat *Captain Maguire*, accomplishing the removal of 76 snags, 19 logs, and 489 overhanging trees.

The total expenditure during the fiscal year amounted to $34,498.64.

The amount expended on existing project up to the close of the fiscal year ending June 30, 1912, was $62,055.42, none of which was for maintenance.

The project is 50 per cent completed. The result has been to make navigation materially easier through the improved portions.

The maximum draft that can be carried at mean low stage of river is 6 feet over the unimproved portions below Sanford and 5.2 feet above Sanford.

The usual variation of water level is 2 feet; the extreme variation 3½ to 5 feet. This section has been improved for its entire length, 115 miles.

The river is navigable, in fact, to Lake Washington, 276 miles above the mouth.

The commerce for the year 1911 amounted to 203,353 short tons, an increase of 77.8 per cent over the tonnage for 1910, valued at $4,548,657, and consisted principally of crate material, fertilizers, fruit, grain, groceries, logs, naval stores, and merchandise. About 75 per cent of the commerce consists of logs. Of the commerce of the river 99,166 tons comes from the Oklawaha River and passes down the St. Johns, only from the mouth of the Oklawaha to Palatka, a distance of 25 miles.

Towns along the river enjoy materially lower freight rates than points not located on the river but equal distances from Jacksonville. The differences frequently amount to 50 per cent.

It is proposed to expend the amount required for expenditure in fiscal year ending June 30, 1914, in continuing the improvement by dredging in furtherance of the existing project and in maintenance. The additional work proposed is for the purpose of extension of benefits.

Amount (estimated) required to be appropriated for completion of existing project	$42,200
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	42,200

WITHLACOOCHEE RIVER, FLA.

The Withlachoochee River rises in the swamp lands of Polk County, Fla., not far from the town of Kissimmee. It flows north and then west and empties into the Gulf of Mexico about 20 miles southeast of Cedar Keyes, Fla., and 101.7 miles north of the entrance to Tampa Bay. Its total length is about 120 miles. Projects for improvement have covered the river from its mouth to Pembertons Ferry, 77 miles up the river. Before improvement the entrance to the Withlacoochee River was crooked and obstructed by reefs. The least depth at mean low water of the Gulf was about 3 feet. Vessels loaded and discharged at an anchorage (called the loading pool) about 9 miles from the entrance. Inside the mouth there was, at mean low water of the Gulf, a depth of 7 to 8 feet as far as Inglis, a distance of 9 miles. Above Inglis the river was obstructed by numerous shoals and snags.

The original project, adopted in 1879, provided for a channel having an available depth of 2 feet during about half the year from the mouth of the river to Pembertons Ferry, a distance of 77 miles, and was completed in 1892.

The second project, adopted June 13, 1902, provided for straightening the channel from the loading pool to the river mouth and deepening it to 8 feet and for work of maintenance.

There was expended on the original and modified projects prior to operations under the existing project the sum of $59,700.41. Of this amount $5,296.38 was applied to the construction of the dredge *Florida.*

A good deal of dredging has been done by the Port Inglis Terminal Co. under permission granted by the Secretary of War.

The existing project, adopted by the river and harbor act of March 2, 1907, provides for a channel 100 feet wide and 10 feet deep at mean low water from Port Inglis to the anchorage in the Gulf of Mexico, at an estimated cost of $215,400 and $5,000 annually for maintenance.

This project is based upon the report contained in House Document No. 483, Fifty-ninth Congress, second session (with maps).

No modification has been made of the existing project.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $221,089.28. No maintenance work has yet been done under this project.

The project is about 80 per cent completed.

A channel 85 feet wide and 10 feet deep at mean low water of the Gulf has been completed to within about three-fifths of a mile of the wharf at Port Inglis, and nearly completed for the remaining distance, depths of 8 feet having been obtained. Rock encountered at this depth prevented the completion of the channel to full depth over the remaining distance. Navigation has been made much easier by the elimination of some sharp turns and by the increased depth and width in the completed portions.

The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality under improvement was 8 feet.

The mean rise and fall of tide at Withlacoochee River entrance is 2.8 feet. The annual variation of water surface in the upper river on account of freshets is about 6 feet.

Length of the navigable channel from the loading pool in the Gulf of Mexico to Port Inglis, at the mouth of the river, is 9 miles; thence up the river to Inglis, 9 miles; thence to Pembertons Ferry, 68 miles.

The head of steamboat navigation is at the county bridge, about 2 miles below Istachatta, or 76 miles above the mouth. The river is navigable, in fact, to Dobes Hole, about 112 miles above the mouth.

The commerce for the year 1911 amounted to 140,285 short tons, valued at $1,416,806, an increase of 12.6 per cent over that of the preceding year. The commerce consisted principally of coal, iron, pyrites, general merchandise, and phosphate. The improvement has materially reduced freight rates throughout the rock phospate mining region.

It is proposed to use the amount estimated as required for expenditure for the fiscal year ending June 30, 1914, in maintaining the improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

CHOCTAWHATCHEE RIVER, FLA. AND ALA.

The Choctawhatchee has its source in southeastern Alabama, flows southerly and southwesterly to Choctawhatchee Bay, an arm of the Gulf of Mexico. The length of the river under improvement covers a distance of about 162 miles from the mouth up to Newton.

Originally the river was impassable during low water for about 10 miles below Newton, due to marl reefs and fish-trap dams, and for the remaining 152 miles to the mouth it was much obstructed by snags, logs, overhanging trees, and sand and gravel bars.

As far back as 1833 work on this river was carried on, there being expended up to 1874 a total of $12,876.62. The original project is apparently that covered by the appropriation made in the act approved June 23, 1874, which provided for removing obstructions.

The project for the improvement, as amended September 19, 1890, contemplated the creation of a low-water navigable channel throughout by removing logs, snags, and overhanging trees, by excavating rock and marl shoals, and by contraction works and shore protection, at an estimated cost of $112,832.

The project was again amended by act approved June 13, 1902, to provide for improvement of Cypress Top Outlet.

The existing project is for improvement and maintenance to provide a low-water navigable channel throughout and for improvement of Cypress Top Outlet, based upon the modifications of the acts of September 19, 1890, and June 13, 1902.

The existing project is based on the river and harbor acts above noted.

Operations during the fiscal year ending June 30, 1912, consisted in deepening shoals at Stricklands Lake Bar and at Cedar Creek Shoal, about 34 miles above the mouth, and in snagging operations for a distance of about 67 miles up the river from the mouth.

The amount expended during the fiscal year was $3,063.04, of which $1,800 was for maintenance.

The amount expended on this river under the existing project (i. e., since 1874) up to the close of the fiscal year ending June 30, 1912, was $201,836.32, of which the greater part has been expended in maintenance. The expenditures prior to 1874 amounted to $12,876.62

The project has been completed, and the additional work required is for maintenance.

A channel 40 feet wide and 3 feet deep was blasted through the marl shoals below Newton to the lower end of these shoals above Pates Landing. A channel 75 feet wide and 6 feet deep at mean low water was dredged through the bar at the mouth of the river (Cypress Top). The river has been practically cleared of snags and other obstructions from time to time, but has again become very much obstructed, being impassable during low water for boats of even light draft from Newton to the mouth of Holmes River, a distance of 122 miles, the available depth at low water being but 20 inches at the end of the fiscal year 1912. From the mouth of the Holmes River to the mouth of the Choctawhatchee River, a distance of about 40 miles, there is a good navigable channel 4 feet deep at mean low water. The actual head of navigation for regular traffic on June 30, 1912, was the mouth of Holmes River.

Variation in water surface from 0 at mean low water to 28 feet at upper limit of the project.

There is no commerce on the river above the mouth of Holmes River, with the possible exception of a small movement of logs. Below this point there is a large commerce in logs and hewn timber, and several steamers ply between Pensacola and Vernon on the Holmes River.

The commerce on this stream is mainly saw logs, timber, naval stores, and general merchandise, reported to have a valuation of $2,000,000 per annum.

The effect of the improvement on freight rates, if any, can not be stated.

The available balance and the additional appropriation recommended will be applied to removal of obstructions for maintenance of improvement below the mouth of Holmes River.

Amount that can be profitably expended in fiscal year ending June 30, 1914. for maintenance of improvement	$9,000

ESCAMBIA AND CONECUH RIVERS, FLA. AND ALA.

These two names apply to one and the same stream, which flows through a heavily timbered country in southern Alabama and western Florida into Escambia Bay, an arm of Pensacola Bay. The change of name occurs at the boundary line between the two States. The timber from this district is brought down the river and forms a large part of all that is exported from Pensacola.

The source of this stream is near the town of Union Springs, Ala., the general direction of flow southerly and south, emptying into Escambia Bay, Fla. The length from source to mouth is approximately 300 miles; the length of the section included in the project is 195 miles. Originally the Conecuh River was impassable for boats, being obstructed by snags, marl reefs, and sand bars; even the transportation of timber and saw logs during high water was difficult. The Escambia River, a continuation of the Conecuh River at the Alabama and Florida line, had a width varying from 150 to 300 feet, with an abundance of water, but was obstructed by snags, log booms, overhanging timber, and a bar at its mouth; this bar interfered seriously with navigation, preventing the entrance of tugs where the rafts were made ready for towing to Pensacola.

The first appropriation for the improvement of this river was made in 1833, and prior to the adoption of the present project $5,000 was expended in removing obstructions. A subsequent appropriation of $5,500, made in 1836, was returned to the surplus fund in 1838. No further appropriations were made until 1880.

The present project, as originally adopted June 14, 1880, provided for the improvement of the river from its mouth to Indian Creek, Ala., an estimated distance of 293 miles, by the removal of snags, logs, and overhanging trees, by excavating rock shoals, by works of contraction and shore protection, and by dredging a channel 150 feet wide and 5½ feet deep at mean low water through the bar at the mouth, all at an estimated cost of $87,430, but the recent adoption of a separate project for the Conecuh River has, in effect, fixed the upper limit of the improvement as the mouth of Patsaliga Creek.

By act of Congress approved March 2, 1907, a project was adopted for completing the improvement of the Conecuh River from the mouth of Patsaliga Creek to the State line between Florida and Alabama by removal of bowlders, snags, and rock shoals, in accordance with report submitted in House Document No. 159, Fifty-ninth Congress, first session, at an estimated cost of $31,000.

The existing project, adopted June 14, 1880, and modified March 2, 1907, provided for a channel 150 feet wide and 5½ feet deep at mean low water through the bar at the mouth of Escambia River, and for the removal of logs, snags, and overhanging trees, rock excavation, works of contraction, and shore protection, from the mouth of Escambia River to Patsaliga Creek, at an estimated cost of $118,430.

The project has been completed and additional work required is for maintenance.

The existing project is based on report printed in Annual Report of the Chief of Engineers for 1879, pages 843 and 852; also in House Document No. 159, Fifty-ninth Congress, first session. (No maps.)

For report on the section from the mouth of Brewton, see House Document No. 261, Sixty-second Congress, second session, without maps.

Operations during the fiscal year ending June 30, 1912, consisted in snagging and removal of overhanging trees. The amount expended during the year was $5,417.86, all for maintenance.

The amount expended to June 30, 1912, on the project as modified was $178,188.04, largely for maintenance.

These expenditures have kept the river fairly free from snags, opened the channel across the bar at the mouth from time to time, and greatly facilitated the rafting and towing of timber; but due to lack of funds in recent years, the river, which in 1900 was practically free from obstructions from its mouth to near the mouth of Patsaliga Creek, again became so much obstructed as to seriously interfere with the rafting at low-water stages.

The combined project is completed. Increased depth secured, about 3 feet throughout the entire improvement included in the project. Ruling depth in Conecuh River, 2½ feet; in Escambia River, from mouth to Moline, 6 feet; Moline to State line, 3 feet. Plane of reference, mean low water from mouth to about 18 miles above; for remainder of river, low water. Variation of water surface, 0, or low water, to about 30 feet at upper limit of project.

The actual head of navigation during ordinary stages of the river is at the mouth of Patsaliga Creek, about 195 miles above the mouth of the Escambia River.

Commerce consists of timber floated in rafts, the value of which in 1911 is estimated at $2,000,000.

Work completed influences the transportation of timber on 170 miles of river, which has been greatly facilitated, admitting of rafting on stages of water some 3 feet less than formerly. The freight per thousand by rail from River Falls, a point 3 miles below Patsaliga Creek, to water is $1.50; by river, it is 75 cents.

It is proposed to apply the funds available and the appropriation recommended in snagging and dredging toward maintenance of the improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$8,000

MOBILE BAR, ALA.

Mobile Bar is located in the Gulf of Mexico off the entrance to Mobile Bay. This bar had a depth of 23 feet at low water over ample width before any work of improvement was commenced upon it. This depth accommodated all the traffic of the Mobile Bay ship channel, but was not sufficient to permit of the utilization of the deep anchorage in lower Mobile Bay beyond the southern limit of the dredged cut leading to the city of Mobile.

The original and existing project for this improvement was adopted in the river and harbor act of June 13, 1902, and provides for the formation of a channel 30 feet deep at low water and 300 feet wide across Mobile Bay, at an estimated cost of $91,250. This work of improvement formed a part of the Mobile Harbor project until March 3, 1905, when by the river and harbor act of that date it was made a separate project, and the limit of cost was increased to $100,000. The channel here is about three-quarters of a mile long, extending from the 30-foot curve on one side of the bar to the 30-foot curve on the other.

The report of the survey on which the project for this improvement is based is printed in House Document No. 219, Fifty-sixth Congress, second session. It contains no maps. It is also printed in the Annual Report of the Chief of Engineers for 1901, page 1854.

No modification has been made in the existing project since its adoption.

The U. S. dredge *Charleston*, borrowed from the Charleston (S. C.) district commenced work on Mobile Bar on April 22, 1912, and has continued since that date, except when weather conditions prevented. During such periods she worked on the lower part of Mobile Harbor channel. The work on Mobile Bar consisted in the removal of 63,852 cubic yards of material, bin measurement. Expenditures amounted to $4,619.05, or 7.25 cents per cubic yard. When the dredge first reached this work, it was found that the channel had shoaled considerably on the east side, the depth being as little as 16 feet on the crest of the shoal. The work of the dredge is being confined as much as possible to this shoal.

Up to June 30, 1912, the total amount expended on the existing project was $181,770.31, of which $83,770.31 was for maintenance. Amount received from sales, $4.55.

Original work under the project has been about 98 per cent completed, but shoaling has occurred so rapidly and persistently that much maintenance work has been found necessary. The maximum draft that can be carried through the channel is now 25 feet at mean low water, and there is a width of about 150 feet with this depth available. There are some shoals where the depth is less than 25 feet on the east side of the channel, and the work of deepening these shoals is now in progress.

The average range of tide is about 1.1 feet.

For commercial statistics and effect of improvement on freight rates see report on Mobile Harbor.

With the funds estimated as a profitable expenditure in the fiscal year ending June 30, 1914, it is proposed to restore the channel to its full dimensions by use of a Government dredge.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement.............................. $20,000

MOBILE HARBOR, ALA.

The channel originally had minimum depths of 5½ feet through Choctaw Pass and 8 feet through Dog River Bar at mean low water, and the available draft for purposes of commerce, by way of Spanish River, the best route then available, was limited to the latter depth. The width of channel over a depth of 5½ feet was about one-half mile.

The improved channel in this harbor is 33½ miles long. The harbor consists of 5 miles of Mobile River, with an average width of 900 feet, which is considered the harbor proper. The balance of the channel is in Mobile Bay. Mobile Harbor is about 92 miles from Pensacola Harbor on the east, and about 61 miles from the harbor at Pascagoula, and about 90 miles from Gulfport Harbor on the west.

The improvement of the channel of Mobile Harbor has been progressive. Between 1826, the date of the first appropriation for this work, and 1857 a channel 10 feet deep was dredged through the shoals in Mobile Bay up to the city of Mobile. Between 1870 and 1876 this depth was increased to 13 feet, the channel being dredged to a width of 300 feet through Choctaw Pass and 200 feet through Dog River Bar.

In 1880 a project for a channel 17 feet deep and 200 feet wide was adopted, and appropriations between 1878 and 1886 were applied to the formation of a channel of these dimensions.

In the river and harbor act of August 11, 1888, a project for securing a channel 23 feet deep was adopted, this project being modified by the river and harbor act of September 19, 1890, so as to provide for the formation of a channel 23 feet deep and with a top width of 280 feet from the Gulf of Mexico to the mouth of Chickasaw Creek, above the city of Mobile. Work upon this channel was completed in 1896, subsequent appropriations, up to and including that made by the sundry civil act of July 1, 1898, having been applied to its maintenance.

The total amount expended on these projects was $3,648,630.60, of which about $115,000 is estimated to have been applied to maintenance.

The next project for the improvement of Mobile Harbor was that adopted by the river and harbor act of March 3, 1899, and provided for the formation of a channel 23 feet deep and 100 feet wide at bottom, with appropriate side slopes, from the entrance of the bay to the mouth of Chickasaw Creek. Work on this project continued until its virtual completion on July 12, 1909.

The act of June 13, 1902, made the removal of sunken obstructions part of the maintenance work in Mobile Harbor.

The total amount expended on the above project was $1,896,860.58, of which $610,832.07 was applied to work of maintenance.

The present project was adopted by the river and harbor act approved June 25, 1910, and provides for the formation of a channel 200 feet wide in Mobile Bay and 300 feet wide in Mobile River, with a depth of 27 feet at mean low water, the work to include the straightening of the channel between beacons 22 and 16 and a turning basin 600 feet by 800 feet at the upper end of the improvement. The estimated cost is $1,802,548. The same act stipulated that the work should be completed within a period of four years, and provided that in the discretion of the Secretary of War the work of straightening the channel should not be undertaken until the present channel shall have been dredged to a depth of 27 feet. In the exercise of this discretion the Secretary of War has authorized the excavation of the straight channel as indicated.

The report of the survey upon which this project is based is printed in House Document No. 657, Sixty-first Congress, second session. This document contains no maps.

No modification has been made in the existing project since its adoption.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $826,483.20, of which $8,560.70 was applied to removal of sunken obstructions in maintenance of improvement, $17,285.03 to the construction and filling of bulkhead in Mobile Harbor, and the balance of $800,637.47 to dredging work, including cost of plant. The total amount received from sales to June 30, 1912, was $1,715.17.

Up to the close of the fiscal year 60 per cent of the work under approved project had been completed. The maximum mean low water draft that can be carried over the shoalest part of Mobile Harbor at this time is 22 feet, being practically the same as last year in some of the sections where no dredging has yet been done under the existing project. The average range of tide is about 1½ feet.

Mobile River is navigable at mean low water for vessels of about 14 feet draft up as far as its head, 45 miles above Mobile.

The combined commerce, foreign and domestic, using Mobile Harbor during the calendar year 1911 aggregated 2,203,712 short tons, valued at $59,027,974. Cotton and cotton products, breadstuffs, lumber, and timber were the principal articles of export, and bananas and sisal grass the most important imports.

The effect of the improvement has been to give Mobile quite a large reduction on rail freight rates from Atlantic seaport cities, and to afford direct water freight rates from Mobile to foreign ports.

Available funds and those estimated below will be applied to a continuation of the work of forming a 27-foot channel in accordance with the approved project, which work is necessary to make the improvement available to the depth mentioned, the removal of any shoals forming in the present channel, and the removal of sunken obstructions in maintenance of the improvement.

It is expected that the present project for Mobile Harbor will be completed for about $120,000 in addition to the funds now on hand, thus effecting a saving of about $330,000 from the amount of original estimate for the 27-foot project.

General improvement.

Amount (estimated) required to be appropriated for completion of existing project	$120,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	220,000

Removing obstructions.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

Consolidated.

Amount (estimated) required to be appropriated for completion of existing project	$120,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	225,000

ALABAMA RIVER, ALA.

This river is formed by the junction of the Coosa and the Tallapoosa, 11 miles below Wetumpka, on the Coosa River, and from this junction to its junction with the Tombigbee to form the Mobile it constitutes a 312-mile link in a waterway 815 miles long from the Oostenaula and Coosawattee Rivers, Ga., to the Gulf of Mexico.

The river was originally so obstructed by logs, snags, overhanging trees, and shoals, many with depths of but 2.5 feet, that during the low-water season navigation was practicable by day only. Long detentions were frequent at many of the shoals below Selma, and when the water was unusually low traffic was suspended between Selma and Montgomery for three or four months in the year.

The general direction of flow is southwest. The section included in the project covers the entire river.

The original project, adopted June 18, 1878, for the improvement of this stream provided for securing a low-water channel 4 feet deep and 200 feet wide by removing snags, logs, and overhanging trees, by constructing works of regulation, and by dredging, all at an estimated cost of $229,741. On this project $185,000 was expended, principally in snagging operations and the construction of works of contraction. These expenditures greatly improved the condition of the channel, freeing it from obstructions, and secured a low-water depth of 4½ to 5 feet.

By act of July 13, 1892, the original project was amended to provide for a low-water channel 6 feet deep, which was to be secured in the same general way as contemplated in the original project, and the estimated cost was placed at $386,251, provided that at least $100,000 should be appropriated annually and $10,000 a year thereafter for maintenance.

Under this project there has been expended $711,541.12, largely for maintenance.

The river and harbor act of March 3, 1905, contemplated securing a continuous channel not less than 4 feet deep in the Alabama River by open-channel work.

The river and harbor act of June 25, 1910, modified and extended the project for this improvement in accordance with plan printed in House Document No. 1089, Sixtieth Congress, second session, which provides for extending the present 4-foot channel through the Alabama and Coosa Rivers to Wetumpka.

The existing project, adopted March 3, 1905, and modified June 25, 1910, contemplates securing a continuous channel not less than 4 feet deep in the Alabama River by open-channel work from the mouth to Wetumpka. No estimate for completion. The estimate submitted for the section between Montgomery and Wetumpka, a distance of 28.61 miles, was $36,000, with $5,000 annually for maintenance.

The project adopted March 3, 1905, is based on the river and harbor act of that date; the project adopted June 25, 1910, is based on House Document No. 1089, Sixtieth Congress, second session. (Contains maps.)

Operations during the fiscal year ending June 30, 1912, consisted in snagging, dredging, and construction of contraction works at various points.

The amount expended during the year was $75,147.01, of which about $30,000 was expended for maintenance.

Receipts from sales, $95.50.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $786,688.13, of which about $260,000 was expended for maintenance.

The approved project was 55 per cent completed up to June 30, 1912, and the maximum draft that could be carried to Montgomery at low water was about 2½ feet; between Montgomery and Wetumpka, 2 feet.

Increased depth secured, 1½ to 3½ feet below Montgomery; none above Montgomery, no work having been done under the project.

The actual head of navigation at ordinary low water is Wetumpka, on the Coosa River, and the variation of the water level is from 0 to 59 feet at Montgomery.

The commerce of this stream is important, consisting principally of cotton, cotton seed, fertilizers, grain, lumber, shingles, naval stores, staves, and a large quantity of miscellaneous freight of all descriptions, the value of which for the year 1911 is reported at 110,231 short tons, valued at $8,253,948. This, however, is but a part of the freight movement that is affected by the improvement, for the actual shipments by water have been relatively small, and, with a river improved for continuous navigation, it is estimated that at least 100,000 tons of the present all-rail freight movement would either go by river or at river rates, and the resulting saving would be very large. In addition, improved facilities would render possible an actual reduction in rates on freight now carried by river.

During the fiscal year 1909 the municipality of Montgomery established a modern wharf at Montgomery, which permits loading and unloading at any stage of the river. There was one barge line established in 1910 for traffic between Mobile and Montgomery and points along the river. This barge line has since been abandoned.

It is proposed to apply funds available and the appropriation recommended in snagging, dredging, and construction of contraction works in furtherance of the project and in maintenance of the improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance............ $100,000

BLACK WARRIOR, WARRIOR, AND TOMBIGBEE RIVERS, ALA.

(*a*) *Black Warrior River.*—This name refers to the section of river above Tuscaloosa. Black Warrior River is formed by the junction of the Mulberry and Locust Forks, 46½ miles above Tuscaloosa. Below Tuscaloosa the same river is called the Warrior, which has a length of 131 miles more to its mouth, near Demopolis, Ala., where it empties into the Tombigbee River. It flows in a general southwesterly direction.

The Black Warrior River was originally closed to navigation on account of shoals at and above Tuscaloosa.

The original project for the improvement was adopted in 1887, the object being to obtain a channel for barges of 6 feet draft at low water all the year round between Tuscaloosa and Daniels Creek, 14½ miles above, by means of five locks and dams, at an estimated cost of $741,670.

Locks Nos. 10, 11, and 12 were built by hired labor and have been completed and opened for traffic since November, 1895.

Lock No. 13 was completed in May, 1905. The river and harbor act of March 3, 1899, provided for the construction of this lock and extended the upper limit of the improvement to the junction of the Mulberry and Locust Forks of the river.

The river and harbor act of March 2, 1907, authorized the construction of Locks Nos. 14, 15, 16, and 17, leaving 18, 19, and 20 to be provided for. It was subsequently decided to build two 21-foot lift locks (Nos. 16 and 17) instead of three 14-foot lift locks on Squaw Shoals, thus reducing the number of locks in the slack-water system necessary to carry the improvement up to the Mulberry and Locust Forks from 20 to 19. Under authority contained in act of Congress approved August 22, 1911, the lift of Lock 17 was changed to 63 feet (flight of two locks to be built here), thus further reducing the number of locks below the Locust and Mulberry Forks to 18, extending slack water to Sanders Ferry, 36 miles above the forks on the Mulberry, and to Nichols Shoals, 16 miles above the forks on the Locust, and dispensing with one lock on each fork.

Lock No. 14 was completed and opened to navigation in March, 1910, and Lock No. 15 in May, 1910.

The completion of six locks on this river has resulted in affording 6-foot navigation at low water from Tuscaloosa to site of Lock No. 16, 25 miles. The minimum width of channel on this section of river is about 250 feet.

Lock No. 16 is being built under contract dated November 28, 1908, and is about 94½ per cent completed. One lock tender's house has been built, and steel gates for this lock have been built with hired labor and are ready for erection.

The construction of Lock 17 was commenced under a contract dated September 20, 1910, providing for 21-foot lift, but after considerable preliminary work had been done by the contractor the height of the lift to be provided at this dam was changed to 63 feet by action of the Secretary of War under act of Congress approved August 22, 1911. A supplemental agreement was then made with the contractor, under date of January 12, 1912, for construction of 63-foot dam, with two locks and lock tender's house.

The improvement of Black Warrior River is based upon the report of a board of engineers dated April 2, 1887, and published in the Annual Report of the Chief of Engineers for 1887, page 1302.

The project as modified provides for slackwater navigation (6-foot depth at mean low water) from Tuscaloosa to Sanders Shoals on the Mulberry Fork, 82½ miles, and to Nichols Shoals on the Locust Fork, 62½ miles. Recent appropriations having been made for locks and dams on the Black Warrior, Warrior, and Tombigbee Rivers, Ala., as one slackwater system, statement of total figures will be found below under the heading *General.*

The total amount expended on this section of river up to the close of the fiscal year ending June 30, 1912, was $2,209,818.70, none of which was applied to maintenance. Work on this part of the approved project, as modified, has been about 62 per cent completed.

For effect of project on freight rates, see data under heading *General* on page 291.

(*b*) *Warrior River*.—This name refers to the portion of the river from Tuscaloosa to its mouth near Demopolis, Ala., where it empties into the Tombigbee River, 131 miles. The same river above Tuscaloosa is called the Black Warrior. It flows in a southwesterly direction. The minimum width of the channel is about 250 feet. Before any work was done on this section the channel width was limited to 60 feet and depth to 1 foot at mean low water, on account of logs, snags, and overhanging trees.

The original project for the improvement, adopted by the river and harbor act approved March 3, 1875, contemplated deepening the channel by jetty construction and the removal of snags and overhanging trees. The amount expended on this project from 1880 until the adoption of the present project was $319,388.30. Prior to 1880 appropriations aggregating $88,000 were expended on the Warrior and Tombigbee Rivers jointly, and an account of this work may be found in the Annual Report of the Chief of Engineers for 1897, page 1679.

The present project, adopted by the river and harbor act of March 3, 1899, for the construction of six locks and dams (Nos. 4 to 9, inclusive, of the Black Warrior, Warrior, and Tombigbee system), with a total lift of 60 feet, and to afford a channel for barges of 6 feet draft at mean low water all the year round between Demopolis and Tuscaloosa, has been completed, except that some dredging is needed near the upper end of each pool to give the required depth at low water; some snagging and bank work are required, fishways should be provided at three of the dams, and additional lock houses which are being built.

For total amount expended on existing project, effect on freight rates, and total project figures, see data given under heading *General* on page 616.

The total amount of commerce using the locks during the fiscal year ending June 30, 1911, was 424,949 short tons, while that for the fiscal year ending June 30, 1912, was 414,114 short tons, principally coal, stone, corn, cotton, logs, staves, and general merchandise. In addition to this there was considerable traffic in logs in the pool between Locks 4 and 5, and considerable coal was handled on the pool between Locks 12 and 13.

(*c*) *Tombigbee River from the mouth to Demopolis (construction of locks and dams)*.—The Tombigbee River rises in the northeastern corner of the State of Mississippi, flows in a southeasterly direction for a length of about 503 miles to its junction with the Alabama River, with which it forms the Mobile River. The section from the mouth to Demopolis is 185 miles in length, and the mouth of the river is 45 miles from Mobile.

For original condition of channel, former projects, and details as to present project, see report on Tombigbee River from the mouth to Demopolis (maintenance of channel) which follows this report. The lock and dam work was adopted by the river and harbor act of September 19, 1890, as part of a project for the improvement of this section, and the river and harbor act of June 13, 1902, made this a part of the project for securing 6-foot navigation all the year round between Mobile and the Warrior coal fields.

This action was based on a survey printed in the Annual Report of the Chief of Engineers for 1890, page 1719, and in House Document No. 156, Fifty-first Congress, first session.

This project has not been modified since the above action.

During the past fiscal year work was carried on under contract at Locks 2 and 3, the principal operations being excavation, placing concrete, and delivering material. Contract work at these two locks has been very slow and unsatisfactory. Expenditures amounted to $201,632.25. At Lock 2 contract work is about 79 per cent completed, and at Lock 3 about 58 per cent. Work on this section under the project is about 73 per cent finished.

The total amount expended on work of lock and dam construction on this section to June 30, 1912, including $11,854.53 for surveys, was $1,196,230.91; for construction of dredge, $40,030; for construction of lock tenders' houses, $18,824.33; and for dredging between locks, $819.86.

This section of river is navigable for a 3-foot draft all the year round except during periods of extreme low water.

For commercial statistics, see report on operating and care of locks.

For total project figures and effect on freight rates, see data included under heading *General*, as follows:

General.—Recent appropriations for slack-watering the Black Warrior, Warrior, and Tombigbee Rivers, Ala., have been made for one system from Mobile to the Mulberry and Locust Forks of the Black Warrior River, 407½ miles. Action taken under act of Congress approved August 22, 1911, extends the upper limit of the project up the Mulberry Fork to Sanders Ferry, 36 miles, and up the Locust Fork to Nichols Shoals, 16 miles. The entire improvement is now considered one project.

The following statement shows the total figures for the present project, as modified, to June 30, 1912:

Total estimated cost of project, including $13,691.24 applied to maintenance work, but not including $3,047.56 received from sales, etc		$8,675,000.00
Total amount appropriated (not including receipts from sales, etc.) to June 30, 1912		[1] 6,920,407.24
Amount authorized, but not yet appropriated	[1] $485,000.00	
Amount required, but not yet authorized or appropriated	1,269,592.76	
		1,754,592.76
Or, in round numbers		1,754,600.00
The following division shows the proposed application of the required $1,754,600:		
For completing locks and dams	$1,624,600.00	
For dredging between locks necessary to secure 6-foot depth	90,000.00	
For removing snags and overhanging trees (original work)	30,000.00	
For building fishways in Dams 7 to 13	10,000.00	
		1,754,600.00
Total amount appropriated, including $3,047.56 received from sales, etc., to June 30, 1912, in all		6,923,454.80
Applied to work of lock and dam construction, including surveys	$5,478,803.49	
Dredging between locks	819.86	

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[1] As affected by sundry civil act of Aug. 24, 1912.

Cost of dredge	$40,030.00	
Cost of lock houses to June 30, 1912	25,351.57	
Snagging work (maintenance)	13,691.24	
		$5,558,696.16
Balance unexpended June 30, 1912, including outstanding liabilities		[1] 1,364,758.64

The lock and dam work on this project is being performed under continuing contract.

The extension of the project up the Mulberry and Locust Forks of the Black Warrior River, Ala., is based on survey, report of which is printed in House Document No. 72, Sixty-second Congress, first session, which contains maps.

The work of lock and dam construction has thus far had a marked effect on traffic. What effect the all-year-round 6-foot navigation will have when obtained can not be definitely stated until the project is completed, but indications are that it will cause great reduction in freight rates and develop an extensive traffic between the coal fields of western Alabama and the Gulf of Mexico.

Contracts now in force require the completion of all locks and dams in the system not already built by about the middle of August, 1914, and all lock tenders' houses during the present fiscal year. It is proposed, also, to complete all the dredging between locks, removal of obstructions, and bank work, necessary to secure 6-foot depth, and the building of fishways at Locks 7 to 13, inclusive, by the time the locks and dams are completed. The entire amount not yet appropriated is therefore given below as that estimated as a profitable expenditure in fiscal year ending June 30, 1914, and includes $485,000 authorized but not yet appropriated.

Dredging between locks.

Amount (estimated) required to be appropriated for completion of existing project	[2] $90,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2] 90,000.00

Locks and dams.

July 1, 1911, balance unexpended	1,215,224.23
June 30, 1912, received from sales	30.00
	1,215,254.23
Less amount allotted for lock houses and dredging between locks (shown above)	35,000.00
	1,180,254.23
June 30, 1912, amount expended during fiscal year, for works of improvement	[3] 319,324.16
July 1, 1912, balance unexpended	860,930.07
July 1, 1912, outstanding liabilities	83,000.00
July 1, 1912, balance available	777,930.07
Amount appropriated by sundry civil act approved Aug. 24, 1912	465,000.00
Amount available for fiscal year ending June 30, 1913	1,242,930.07
July 1, 1912, amount covered by uncompleted contracts	2,502,000.00

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[1] As affected by sundry civil act of Aug. 24, 1912.

[2] Exclusive of amount available for fiscal year 1913.

[3] Of this amount $485,000 is covered by continuing-contract authorization provided by act of 1911.

Amount of continuing-contract authorization, act of June 25, 1910	$500,000.00
Amount of continuing-contract authorization, act of Feb. 27, 1911	700,000.00
	1,200,000.00
Amount appropriated under such authorization	715,000.00
Amount yet to be appropriated	485,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 1,664,600.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] [2] 1,664,600.00

Consolidated.

July 1, 1911, balance unexpended	1,226,399.90
June 30, 1912, received from sales	30.00
	1,226,429.90
June 30, 1912, amount expended during fiscal year, for works of improvement	326,671.26
July 1, 1912, balance unexpended	899,758.64
July 1, 1912, outstanding liabilities	85,550.00
July 1, 1912, balance available	814,208.64
Amount appropriated by sundry civil act approved Aug. 24, 1912	465,000.00
Amount available for fiscal year ending June 30, 1913	1,279,208.64
July 1, 1912, amount covered by uncompleted contracts	2,511,000.00
Amount of continuing-contract authorization, act of June 25, 1910	500,000.00
Amount of continuing-contract authorization, act of Feb. 27, 1911	700,000.00
	1,200,000.00
Amount appropriated under such authorization	715,000.00
Amount yet to be appropriated	485,000.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 1,754,600.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2] 1,754,600.00

TOMBIGBEE RIVER FROM THE MOUTH TO DEMOPOLIS (MAINTENANCE OF CHANNEL).

This section is 185 miles long.

The original condition of the channel of this portion of the river was such as to permit of steamboat navigation during high-water stages only, lasting about six or eight months of the year. The minimum width of the channel was about 100 feet and the minimum depth 2 feet at mean low water.

The original project for the improvement of this stream, as adopted in 1871, contemplated the removal of snags and other obstructions in the channel of the river and the widening and deepening of the existing channel through various shoals, at an estimated cost of $21,500.

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[1] Exclusive of amount available for fiscal year 1913.

[2] Of this amount $485,000 is covered by continuing-contract authorization provided by the act of 1911.

The project adopted in 1879 was to afford a channel of navigable width and 4 feet deep at ordinary low water from the mouth to Demopolis, a distance of 185 miles, by the removal of snags, logs, and overhanging trees, and the improvement of the worst bars by dredging.

The earlier projects for the improvement of this section of Tombigbee River were superseded by the project adopted in the river and harbor act of September 19, 1890. The project adopted at that time provided for securing a channel 6 feet deep at low water between the mouth and Demopolis by the construction of locks and dams and bank revetments, and by the removal of logs, snags, and other obstructions. The cost of this project was originally estimated at $508,808.98, but in 1897, after $330,000 had been appropriated for the work, the estimate was increased, the additonal cost of completion being then placed at $600,000.

By the river and harbor act of June 13, 1902 the formation of a 6-foot channel below Demopolis by constructing locks and dams was made a part of the project for securing 6-foot navigation in the Black Warrior, Warrior, and Tombigbee Rivers, Ala. Information in regard to work accomplished on the Tombigbee River under this project and the expenditures made in connection therewith will be found in the section of this report immediately preceding.

Under previous projects this section of the Tombigbee River has been repeatedly cleared of snags, dikes have been constructed, dredging has been done at the worst bars, and the channel made navigable for steamboats at low stages of the river.

Prior to commencement of work under the existing project there was applied to channel work on this section of river $249,542.48.

The existing project for improvement of the Tombigbee River from the mouth to Demopolis was adopted by the river and harbor act of June 13, 1902, and contemplates the maintenance of the existing channel by the removal of logs, snags, and other obstructions from the stream, and by the repair of dikes.

The present project for snagging, as well as that for lock and dam construction, is based on a survey, report of which is dated December 24, 1889, and is printed in Annual Report of the Chief of Engineers for 1880, page 1719, and in House Document No. 156, Fifty-first Congress, first session. This document contains no map. This survey appears to be the only one ever made of this section of river.

Expenditures during the past fiscal year amounted to $11,251.84, which was applied to the removal of 22,519 overhanging trees and sunken obstructions, as well as payment of office and engineering expenses. Work was restricted to maintenance of the improvement.

The total amount expended under the existing project to June 30, 1912. was $79,420.68, all of which was applied to maintenance. Total amount received from sales to same date was $213.24.

The work done has resulted in affording a channel navigable for steamboats drawing not more than 3 feet all the year round, except during periods of extreme low water, and since Lock 1 was opened to traffic in September, 1908, there has been a 6-foot channel all the year to a point 190 miles above Mobile.

Floods at Demopolis rise at times to a stage of 60 feet above low water.

Commerce on this section during the fiscal year ending June 30, 1912, amounted to 149,900 short tons, principally logs, lumber, cotton, fertilizer, and general merchandise, valued at $3,930,516.31.

This project has directly resulted in affording water and lower rail rates from Mobile to points on the river below Demopolis, Ala.

Available funds and future appropriations will be applied to maintenance of the existing channel and placing the river in good condition before completion of the dams at Locks 2 and 3.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$12,500

TOMBIGBEE RIVER FROM DEMOPOLIS, ALA., TO COLUMBUS, MISS.

The Tombigbee River rises in the northeastern corner of the State of Mississippi, and flows in a southeasterly direction to its junction with the Alabama River in the formation of the Mobile River. It is about 503 miles long. The section of river from Demopolis to Columbus is 149 miles in length. Demopolis, the lower limit, is 230 miles from Mobile by river. The fall in the river between Demopolis and Columbus is 108 feet.

The original condition of this section of the river was such as to admit of navigation only during high-water stages. The channel was obstructed by shoals, logs, and overhanging trees, the minimum depth being 1 foot at mean low water and the minimum width of channel 70 feet. The improvement of the Tombigbee River between Demopolis and Columbus was commenced under the project of 1871, which contemplated the improvement of this stream by the removal of snags and other obstructions in the river and the widening and deepening of existing channels through various bars. In 1879 this project was modified so as to provide for the formation of a channel of navigable width and 3 feet deep at low water from Demopolis to Columbus, this section forming a part of two different improvements.

Prior to adoption of the present project $63,382.98 was expended on this section of the river.

The present project for improvement of this section of Tombigbee River, adopted in 1890, provides for securing a channel 6 feet deep at low water from Demopolis to Columbus, a distance of 156 miles, by snagging, tree cutting, bank revetment, bar improvement, and the construction of locks and dams, at a cost originally estimated at $779,400. In 1897 the construction of locks and dams was estimated to cost $2,000,000. This project was adopted by the river and harbor act of September 19, 1890, but no provision has yet been made by Congress for commencing the work of lock and dam construction.

Report on the survey upon which the present project is based is printed in House Document No. 156, Fifty-first Congress, first session. This document contains no map. This report is also printed in the Annual Report of the Chief of Engineers for 1890, page 1719. This section of river was at that time divided into two parts, one from Demopolis to Vienna, and the other from Vienna to Cotton Gin, or Columbus.

An examination was made of this section of river in 1905, and report thereon, dated December 9, 1905, is printed in House Document No. 334, Fifty-ninth Congress, second session. It contains no map.

The existing project therefore provided for a channel 6 feet deep at mean low water, to be obtained by snagging, tree cutting, bank revetment, bar improvement, and the construction of locks and dams.

The new self-propelling U. S. snag boat *Vienna* commenced her maiden trip in June, 1911, and began snagging work at Demopolis, Ala., July 1, 1911, working upstream until December 8, 1911, when work was stopped, due to the near exhaustion of funds. The distance worked over was 136½ miles, removing 12,361 obstructions at a total cost of $7,826.25, all this work being in maintenance.

Only the snagging work of this project has been undertaken, as no appropriations have been made for the construction of locks and dams. No surveys have been made for location of locks upon which to base definite estimate of their cost, so that the percentage of completion of project can not be given.

The total amount expended on work under the existing project up to the close of the fiscal year ending June 30, 1912, was $198,040, of which $97,583.11 was applied to maintenance. Amount received from sales, $40.

The maximum draft that can be carried over this locality on June 30, 1912, is 2 feet at mean low water. The extreme oscillation of the river at Demopolis, Ala., is 69 feet, high-water stages ranging from 50 to 60 feet above mean low water.

This entire section of Tombigbee River is open to steamboat navigation throughout the year, except during the period of extreme low water in the fall of the year. At present the regular packet steamers out of Mobile navigate this part of the river during the winter and spring seasons, and it is reported that one steamboat line intends to build a light-draft steamer to operate the balance of the year.

Commerce on this section during the calendar year 1911 amounted to 45,399 short tons, valued at $503,086, being principally cotton, cotton seed, fertilizer, hardware, logs, staves, and miscellaneous.

The project results in affording lower rail rates from Mobile to points on the Tombigbee River above Demopolis for several months each year.

With the funds estimated as a profitable expenditure during the fiscal year ending June 30, 1914, it is proposed to carry on work of snagging and bar improvement from Demopolis upstream.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement $15,000

TOMBIGBEE RIVER FROM COLUMBUS TO WALKERS BRIDGE, MISS.

For length and direction of flow of the Tombigbee River see report on section Demopolis to Columbus preceding. The section from Columbus to Walkers Bridge is 169 miles long. The fall in this section of river is not definitely known. Columbus, the lower limit, is 334 miles from the mouth of the river.

Prior to 1902 this improvement was divided into two sections, one from Columbus to Fulton, 144 miles, and the other from Fulton to Walkers Bridge, 25 miles, for which appropriations were made separately.

The original condition of the river was such that navigation was impossible except at high water and difficult even at that stage, owing to the logs, snags, and overhanging trees which obstructed the channel. The minimum depth in the channel was about 1 foot at mean low water and the minimum width was 50 feet.

The project for the improvement of the river above Columbus was adopted in 1873, and provided for obtaining a good high-water channel by the removal of obstructions, at an estimated cost of $35,000. This project was completed in 1882, at a cost of $27,293.65, since which time operations have been directed toward maintaining the improvement. The first specific appropriation for the portion of the river between Fulton and Columbus was made in 1892, this money, together with subsequent appropriations, being applied to the maintenance of a high-water channel.

The project for improvement of the river from Fulton to Walkers Bridge was adopted in 1888, and provided for securing a high-water channel by the removal of logs, snags, and overhanging trees, at an estimated cost of $11,000, and for the maintenance of the same at an annual cost of $1,500. This project was adopted by the river and harbor act of August 11, 1888, and was completed in 1891, at a cost of $6,517.19.

Survey of Tombigbee River from Fulton to Columbus was made in 1873, and reference to report thereon is contained in Annual Report of the Chief of Engineers for 1892, page 1448. Report on an examination of the river from Fulton up to Warrens Mill (Walkers Bridge) is printed in the Annual Report of the Chief of Engineers for 1882, page 1312.

The existing project for this section of river provides for maintaining a high-water channel by the removal of snags, logs, and overhanging trees.

No work was done on this section of river during the past fiscal year. Expenditures amounted to $3,251.05, and were applied to care and repair of plant and the payment of office expenses and incidentals.

An examination of this section of river was made in November and December, 1910, and revealed the fact that the river from Walkers Bridge down to Aberdeen, Miss., was not susceptible of improvement at a reasonable cost, considering the benefits to be derived and the commerce involved. It was therefore recommended by the district engineer and the division engineer that the improvement above Aberdeen, Miss., be abandoned. This recommendation was concurred in by the Board of Engineers for Rivers and Harbors, and under date of April 14, 1911, the Chief of Engineers directed that work on this section, with funds available, be restricted to improvement at and below Aberdeen.

The channel from Columbus to Aberdeen, Miss., about 50 miles, has a maximum mean low-water depth of about 2 feet in the shoalest part, but is considerably obstructed by snags and logs. At Columbus the river rises as much as 46 feet above low water. Above Aberdeen the river is used almost exclusively for rafting, for which purpose it is available at high stages. It is believed that the improvement of the Tombigbee River above Aberdeen should be abandoned, and the improvement from Columbus to Aberdeen, Miss., be merged with the improvement of this river from Columbus, Miss., to Demopolis, Ala., making one improvement of the two sections, and that appropriations should be made accordingly.

The total amount expended on improvement of this section of river up to the close of the fiscal year ending June 30, 1912, was $90,120.55, of which $56,309.71 was for maintenance.

Commerce on this section during the calendar year 1911 amounted to 1,080 short tons of logs and 1,346 short tons of general merchandise, valued at $30,145.

The project has had no effect on freight rates.

With available funds and future appropriations it is proposed to maintain a high-water channel by removal of sunken obstructions and overhanging trees.

July 1, 1911, balance unexpended	$3,797.55
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	3,251.05
July 1, 1912, balance unexpended	546.50
July 1, 1912, outstanding liabilities	259.99
July 1, 1912, balance available	286.51

CHANNEL BETWEEN MOBILE BAY AND MISSISSIPPI SOUND, ALA.

Originally there was a depth on the shoal between Mobile Bay and Mississippi Sound of 3 feet and a width of 500 feet at mean low water.

The proposed channel follows Pass aux Herons, which lies between Mobile Bay and Mississippi Sound, about 27 miles south of Mobile Harbor and about 29 miles east of Pascagoula River, Miss.

The act of Congress approved March 23, 1828, appropriated $18,000 for purpose of forming a channel through this pass. Some work was done with these funds, but there appears to be no record of the amount expended or the results accomplished.

The present project, adopted by the river and harbor act of July 25, 1912, provides for a channel 100 feet wide at bottom and 10 feet deep at mean low water, to extend from Mobile Bay to Mississippi Sound, about 2¼ miles, at an estimated cost of $49,359.90. The examination and survey report upon which this project is based is printed in House Document No. 967, Sixtieth Congress, first session, and contains a map. Report of previous examination and survey of this pass may be found in the Annual Report of the Chief of Engineers for 1884, page 1228.

The river and harbor act of July 25, 1912, appropriated $50,000 for this work, which will be applied to dredging out the channel during the current fiscal year.

No work was done during the past fiscal year, no funds being available.

The maximum draft that can be carried over this channel on June 30, 1912, at mean low water is 3 feet. The average range of tide is about 1½ feet.

Nearly all the commerce uses Grants Pass at this time, which is only a short distance from Pass aux Herons, but Grants Pass is owned by private parties and tolls are charged for its use.

The project when completed will result in affording a saving in freight rates and a better channel between Mobile and points on the Gulf coast to the west.

The amount estimated below as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to maintenance of channel to be dredged during the current fiscal year:

Amount appropriated by river and harbor act approved July 25, 1912	$50,000
Amount available for fiscal year ending June 30, 1913	50,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 8,000

HARBOR AT BILOXI, MISS.

Originally the channel leading to Biloxi was about a quarter mile wide and had an available depth of 4 feet at mean low tide.

The harbor at Biloxi has an average width of about 500 feet, with a length of 6,000 feet and depths ranging from 8 feet to 13½ feet. It is about 14 miles east of Gulfport, Miss., and 32 miles west of Pascagoula, Miss.

The original project for its improvement was adopted in 1882 and contemplated the formation of a channel through Deer Island Flats to connect Biloxi Bay with the Back Bay of Biloxi, at an estimated cost of $35,000. The channel thus proposed was to have a depth of 8 feet at mean low water, with a width sufficient for navigation.

This project was modified by the river and harbor act of July 5, 1884, so as to provide for a channel 8 feet deep and 150 feet wide from Mississippi Sound to the wharves at Biloxi, at an estimated original cost of $55,000. This project was completed from 1887 to 1893, at a cost of $44,382.27.

There has been no change in the project for this improvement as finally adopted in 1884. Since 1893 funds have been appropriated for and applied to maintenance of a channel 8 feet deep and 150 feet wide from Mississippi Sound to the wharves at Biloxi.

No work was done on this improvement during the past fiscal year. The expenditure of $260.74 made was applied to upkeep of plant last used in maintenance dredging at this locality.

The total amount expended on the existing project up to the close of the fiscal year was $76,069.67, of which $31,687.40 was applied to maintenance.

The maximum draft that can be carried over the shoalest part of this locality on June 30, 1912, is 6½ feet at mean low tide. The average range of tide is about 1½ feet. The channel is about 1¼ miles long, extending from the 8-foot contour in Mississippi Sound to the 8-foot curve of depth in Biloxi Harbor.

Commerce using this improvement during the calendar year 1911 amounted to 84,167 short tons of fish and oysters, lumber and timber, and naval stores and brick, valued at $795,100.

This project apparently has little or no effect on freight rates.

It is proposed to apply the funds estimated as a profitable expenditure in fiscal year ending June 30, 1914, to work of dredging in maintenance of the improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

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[1] Exclusive of amount available for fiscal year 1913.

HARBOR AT GULFPORT AND SHIP ISLAND PASS, MISS.

Originally no channel existed between Ship Island Harbor and Gulfport, Miss. The depths on the site of the channel ranged from 19 to 8½ feet, and over the site of the anchorage basin they varied from 8½ to 2½ feet at mean low water.

The harbor here is 1,320 feet by 2,640 feet, and it has a depth of about 22 feet at mean low tide. It is about 44 miles from Pascagoula Harbor on the east and about 78 miles from New Orleans (via Lake Borgne Canal) on the west.

The existing project was adopted by the river and harbor act of March 3, 1899, which authorized the Secretary of War to enter into contract for dredging a channel 300 feet wide and 19 feet deep at mean low water from the anchorage basin at Ship Island Harbor, on the Gulf of Mexico, to Gulfport, Miss., and to construct at the end of this channel next to the shore an anchorage basin of similar depth and not less than 2,640 feet by 1,320 feet in area. This act also authorized the Secretary of War to contract for the maintenance of this channel and anchorage basin for a term of five years after their completion for the sum of $10,000 annually.

This project was modified by the river and harbor act of June 25, 1910, by authorization of additional depth in basin and channel not to exceed 23 feet. It was further modified by the river and harbor act of February 27, 1911, which made an appropriation of $100,000, and provided that of this amount $60,000, or so much thereof as may be necessary, may be expended in the repair and modification of the U. S. dredge *Barnard*, which was formally assigned to Gulfport Harbor and Channel, in accordance with recommendations contained in Rivers and Harbors Committee Document No. 2, Sixtieth Congress, first session, which contemplates obtaining and maintaining such depths in the anchorage basin, and such depths and widths in the channel from the basin to Ship Island Harbor as may be practicable by the operation of a Government dredge; and still further modified by the river and harbor act of July 25, 1912, which authorized the purchase or construction of a new dredging plant and the retransfer of the dredge *Barnard* to the Southwest Pass improvement.

Contract was entered into in 1901 for dredging the channel and anchorage basin, the work to be completed within two years from April 21, 1901, for $150,000, and for the maintenance of the channel and basin for a term of five years after completion for the sum of $10,000 per annum. Work was commenced on April 16, 1901. By joint resolution of Congress, approved June 14, 1906, it was provided that the channel and basin should be accepted as dredged, and that $150,000 should be paid the contractor for the work, the channel and basin having been dredged to the approximate depth and width required in the contract. The payment was made. The period of maintenance commenced June 14, 1906.

The river and harbor act approved March 2, 1907, appropriated $100,000 for continuing the improvement and maintenance of the anchorage basin at Gulfport and channel therefrom to the anchorage or roadstead at Ship Island, also Ship Island Pass between Ship and Cat Islands, Miss., and authorized the Secretary of War to annul that portion of the contract entered into February 20, 1901, with Spencer S. Bullis, relating to the maintenance of a channel and anchorage basin between Ship Island and Gulfport. The annulment of this contract was effected by a supplemental agreement approved by the Secretary of War June 11, 1907.

The report of the survey upon which the improvement of Gulfport Harbor and Ship Island Pass, Miss., was originally based is printed in the Annual Report of the Chief of Engineers for 1899, page 1787. Reports of another examination and survey of this locality are printed in House Document No. 184, Fifty-ninth Congress, second session, and in Document No. 2, Committee on Rivers and Harbors, House of Representatives, Sixtieth Congress, first session.

Prior to the act of March 2, 1907, appropriations were made separately for Gulfport Harbor, Miss., and Ship Island Pass, Miss.

To the work of maintenance of Gulfport Harbor and channel and to extension of depths in same, the sum of $370,073.33 has been applied.

Under an appropriation of $40,000, carried by the river and harbor act of March 3, 1899, the channel through Ship Island Pass was dredged from its original depth of 21 feet to the project depth of 26 feet at mean low water and 300 feet width. These depths were 20 feet and 25 feet, respectively, referred to present datum. Of the above appropriation $39,695.88 was applied to this work and the balance turned back into the Treasury.

To the work of restoration and maintenance of the Ship Island Pass Channel, $18,079.64 has been applied.

The project for Gulfport Harbor, as at present approved, contemplates maintenance of the anchorage basin at Gulfport, 1,320 feet by 2,640 feet, and channel therefrom to Ship Island anchorage, 13¼ miles, with such depths and widths as may be practicable by the operation of a Government dredge.

The present project for Ship Island Pass provides for restoration of the channel there across the bar 300 feet wide and 26 feet deep at mean low water.

The U. S. dredge *Pascagoula* was engaged on the Gulfport Channel from July 2 to September 15, 1911, removing 1,560,985 cubic yards of material, place measurement, at a field cost of $24,141.80, or 1.55 cents per cubic yard, and a gross cost, including surveys, office expenses, etc., of $31,054.85, or 1.99 cents per cubic yard. These funds were applied to maintenance work and extension of depth, and the portion of channel worked over was that from 1,000 feet south of the pier to 1,612 feet south of Beacon 4, a distance of 32,484 feet, leaving an average depth of 22½ feet at mean low water.

In addition to the above, $926.48 was applied to repair of the bulkhead built by the United States at Gulfport; $1,411.03 was expended on repair and upkeep of the pipe line of the dredge *Barnard*, and $76.89 for the repair and operation of the automatic tide gauge maintained at Gulfport. The sum of $1,137.82 was expended from the allotment for work at Ship Island Pass, Miss., and was applied to payment of part of the cost of transferring the U. S. dredge *Charleston* from Charleston (S. C.) district to the Mobile district, as it is intended to use this dredge on the Ship Island Pass work after completing its work on Mobile Bar.

Since the last dredging was done here a large amount of shoaling has taken place, especially near the inner end of the channel, where there is a depth of only 16 feet. The material, however, is very soft and a draft of 18 feet at mean low water can be carried. Very little shoaling occurs in the basin since the construction of the bulkhead at its entrance, and there is now an average depth of 21 feet at mean low water except in the northwest corner, which has not been dredged for several years.

The average range of tide for Gulfport Harbor and Ship Island Pass is about 1½ feet.

The maximum draft that can be carried over the shoalest part of the improvement at Ship Island Pass is 23 feet at mean low water.

The total amount expended on the entire improvement to June 30, 1912, was $614,048.70, of which $388,152.97 was applied to maintenance. Of the amount expended, $556,273.18 was applied to Gulfport Harbor and $57,775.52 to work at Ship Island Pass. Amount received from sales, $179.35.

The commerce of Gulfport Harbor and Ship Island Pass during the calendar year 1911 amounted to 1,027,302 short tons, principally lumber, timber, cotton, and naval stores, valued at $14,456,065.

The project results in affording a reduction in rail freight rates between Gulfport and seaboard cities of the Atlantic coast and in affording water freight rates from Gulfport to foreign ports.

With available funds and those estimated as a profitable expenditure for the fiscal year ending June 30, 1914, it is proposed to construct a dredge and attendant plant for this harbor and to maintain the improvement and obtain such additional depths as may be possible.

Consolidated.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	$87,000

HORN ISLAND PASS, MISS.

The channel through the bar had before improvement a depth which increased through natural causes from 14 or 15 feet in 1853 to about 18 feet in 1886, and has been available at low water since the latter date for vessels up to a draft of slightly less than 18 feet at mean low water.

Under the appropriations for improving Pascagoula River, Miss., carried by the river and harbor acts of August 18, 1894, and June 3, 1896, provision was made for the removal of the bar in Horn Island Pass, and in conformity with this provision a channel with a least depth of 20.5 feet (19.5 feet referred to the existing datum), and with a width of 200 feet, was dredged through the Horn Island Bar. The total cost of this work was $7,682.40, but the benefit of the improvement was soon lost through shoaling.

Under the appropriations for Pascagoula River and Horn Island Harbor carried by the river and harbor act of March 3, 1899, and the sundry civil act of June 6, 1900, an amount estimated at $88,000 was applied to dredging a 20-foot (19 feet present datum) channel at certain shoal areas in the Horn Island anchorage basin, the work being in progress between 1899 and 1901.

The existing project for the improvement of Horn Island Pass provides for the formation of a channel 21 feet deep at low water, 300 feet wide through the outer bar, and 200 feet wide elsewhere in the pass, at an estimated cost of $40,480, and $9,000 annually to preserve the improvement. The project was adopted by the river and harbor act of March 3, 1905, which carried an appropriation of $40,480 for the work. The project was completed by the U. S. dredge *Charleston* in 1907. Work since that date has been for maintenance only.

There has been no change in the existing project since its adoption.

No work was done on Horn Island Pass during the past fiscal year. Expenditures amounted to $646.70 and were applied to payment of part of the cost of transferring the U. S. dredge *Charleston* from the Charleston, S. C., district to the Mobile district, as this dredge will be used during the approaching season on the Horn Island Pass work.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $64,079.56, of which $23,599.56 was applied to maintenance.

The maximum mean low-water draft that can be carried over the shoalest part of the locality on June 30, 1912, is 21 feet. The average range of tide is about 1.1 feet.

Commerce using the channel through Horn Island Pass during the calendar year 1911 amounted to about 266,654 short tons of lumber, timber, crossties, and piling, valued at $1,906,540.

This improvement, in conjunction with that of Pascagoula River, from which it is distant about 9 miles, results in effecting a reduction in rail freight rates between Pascagoula, Miss., and seaboard cities of the Atlantic coast, and in affording direct water freight rates on lumber from Moss Point and Pascagoula to foreign ports.

Available funds and future appropriations will be applied to maintenance of the channel through Horn Island Pass.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

PASCAGOULA HARBOR, MISS.

Before this improvement was commenced the channel through the bar at the mouth of the river had a least depth of 3 feet at mean low water, the width being 1,000 feet, while inside the mouth for a distance of 10 miles upstream the river was navigable for vessels of 6½ feet draft.

The harbor proper is from 300 to 700 feet wide and about 11 miles long, extending from the mouth of Pascagoula River to a point 4 miles up Dog River. It is about 61 miles distant by water from Mobile on the east and about 44 miles from Gulfport, Miss., on the west.

The existing project for the improvement of Pascagoula River was adopted in the river and harbor act of March 3, 1899, and provided for the formation of a 12-foot channel from a point in Dog River 3 miles above its mouth down the Pascagoula River to the 12-foot contour in Mississippi Sound, 150 feet wide above and 300 feet wide below the railroad bridge at Scranton (Pascagoula), Miss., at an estimated cost of $317,600, including the formation of a 20-foot channel through certain shoal spots in the Horn Island anchorage. This project is based on survey dated December 28, 1896, printed in Annual Report of the Chief of Engineers for 1897, page 1718, and House Document No. 211, Fifty-fourth Congress, second session, which contains a map.

Work under this project was in progress between September, 1899, and February, 1902, during which time an uninterrupted 12-foot channel was obtained within the limits of the project in Pascagoula River, while a 20-foot channel was formed through the shoal areas in Horn Island anchorage.

The river and harbor act of June 13, 1902, modified and extended the existing project so as to provide for a channel 17 feet deep, instead of 12 feet from 3 miles above the mouth of Dog River to Mississippi Sound, at a total cost of $1,050,222, exclusive of the Horn Island improvement.

The river and harbor act approved June 25, 1910, further modified the project for this improvement by extending the upper limit about 1 mile farther up Dog River, increasing the total cost of the project by $8,000. This action was based upon a survey the report of which is printed in House Document No. 642, Sixty-first Congress, second session. This document contains no map.

The existing project with all modifications incorporated provides for a channel 17 feet deep and 150 feet wide from a point on Dog River 4 miles above its mouth down Dog River and Pascagoula River to the railroad bridge at Pascagoula, Miss. (formerly Scranton); thence 17 feet deep and 300 feet wide to the deep water in Mississippi Sound.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $840,004.81, excluding the expenditure of about $88,000 on the work performed at Horn Island. Of this amount, $233,543.20 was applied to maintenance. Amount received from sales, $53.90.

Up to the end of the fiscal year 85 per cent of the approved project had been accomplished, resulting in the completion of channel to project dimensions above the railroad bridge at Pascagoula, Miss., and the dredging of that part below the bridge to project depth for a width of 225 feet. The maximum draft that can be carried over the shoalest part under improvement is 17 feet at mean low water. The average range of tide is about 1½ feet.

The commerce of this harbor for the calendar year ending December 31, 1911, amounted to 972,944 short tons, principally logs, lumber, and naval stores, valued at $6,560,380.

The project results in effecting a reduction in rail freight rates between Pascagoula, Miss., and seaboard cities of the Atlantic coast, and also in affording direct water freight rates on lumber from Moss Point and Pascagoula to foreign ports.

It is proposed to apply the funds estimated as a profitable expenditure in fiscal year ending June 30, 1914, to maintenance of the improvement.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$30,000

The following report of the Board of Engineers, in which the Chief of Engineers concurs generally, is printed in House Document No. 682, Sixty-second Congress, second session.

This investigation covers Pascagoula River and its tributary, Dog River, and Horn Island Pass, in which there has been provided by the General Government a channel 17 feet deep at mean low water throughout to Horn Island Pass and thence 21 feet deep to the Gulf of Mexico.

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS.
Washington, March 18, 1912.

Respectfully returned to the Chief of Engineers, United States Army.

A survey having been made of the Pascagoula River from the upper limits of the present project in Dog River to deep water in the Gulf of Mexico, the district officer presents estimates for channels of varying widths and depths in sums ranging from $311,920 to $484,950, the work of channel excavation to be done with a Government-owned plant. He also gives estimates for similar work under contract prices, ranging from $522,720 to $818,240. He selects as suitable and adequate for present and immediately prospective needs of commerce a channel 150 feet wide, with greater width at sharp bends, and 22 feet deep from the railroad bridge at Pascagoula to a point on Dog River 4 miles above its mouth. below said bridge a channel 225 feet wide and 22 feet deep to Horn Island Pass, and a channel 300 feet wide and 25 feet deep across the outer bar at a total estimated cost of $383,030 for original excavation and $50,000 per year for maintenance. He believes such an improvement justified by the interests involved, and he recommends a modification of the existing projects in accordance therewith. The present commerce of Horn Island Pass as reported in the Annual Report of the Chief of Engineers for 1911 amounts to about 434,522 tons, and the average annual cost of lighterage for the past five years, which it is claimed would be saved to the shippers on the Pascagoula if a satisfactory depth was provided, was $23,245 to Horn Island anchorage and $115,925 to other harbors.

The district officer states that provision by the locality should be made for suitable landing places at Moss Point and Pascagoula, to be open to the public forever on just and equal terms. He suggests a water frontage of 800 feet with a width of 150 feet, and free communication with the city streets, as being sufficient for this purpose in each case, and he recommends that if the project now proposed is adopted the expenditures be made contingent upon such landing places being furnished without cost to the United States.

For reasons given by him the division engineer is unable to concur in this recommendation. He states that the commerce of the port consists almost entirely of lumber and timber products, and invites attention to the increase in length of dredged channel and in the amount of fill to be expected. He questions the adequacy of the estimate for maintenance, believing that it will be nearer $60,000 or $65,000 per year. He believes, however, that if the work could be performed for a much smaller sum, or if there were strong reasons to believe that the commerce would be considerably increased thereby, there would be no question concerning the advisability of the improvement. He states that the expenditures seem to be desired for the purpose of removing a burden from existing commerce, which removal will apparently cost as much as the benefits resulting.

At the request of the board interested parties were given an opportunity of presenting their views on the subject of this improvement, and on March 11 Hon. John Sharp Williams, United States Senator, Hon. B. P. Harrison, M. C., Hon. B. G. Humphreys, M. C., and a committee from the locality appeared before the board in behalf of the project proposed by the district officer. It was stated at this hearing that there would be no objection on the part of the community to furnishing suitable landings, but that the width proposed by the district officer was thought to be unnecessary and onerous, as it reached into the city streets. The question of possible local cooperation was suggested by the board, but those present were not prepared to make definite statements in this matter.

The board has given this matter very careful consideration. The length of the proposed channel is 22.7 miles, of which 21.8 miles will require dredging. The cost of maintenance will be increased, not only because of the additional length of channel, but also by reason of the material increase in depth proposed. The cost of maintenance of the existing project is given at $30,000 per annum; that of the proposed project $50,000 per annum by the district officer, or $60,000 to $65,000 as estimated by the division engineer.

In the opinion of the board the cost of original construction coupled with this large item for maintenance exceeds the amount the United States would be justified in expending for the benefit of general commerce and navigation at this locality. It is true there would result from the improvement a considerable saving in lighterage charges ot those engaged in handling the one commodity of lumber. The board recognizes the handicap under which these interests operate, and also the fact that there would be some indirect benefit to the community at large by a reduction in the cost of marketing this commodity in large quantities. It believes, therefore, that it would be of mutual advantage to these interests and to the public at large to cooperate in the work of bettering navigation facilities. In various cases somewhat similar to this, the board has recommended that the local interests bear 50 per cent of the cost of the improvement. However, in this locality, since, as above noted, the excessive cost arises chiefly from the large amount of maintenance necessary, it believes that the locality should contribute toward this maintenance a sum sufficient to cover the extra cost thereof for approximately five years, viz, $100,000, a period sufficient to determine the benefits to be derived from the improvement, and that it will be more satisfactory to both the Government and local interests if this contribution takes the form of a fixed sum, to be applied either to original work or to maintenance as may be found advisable and to be paid in equal installments for five years beginning with the first Government appropriation for the work.

In view of the foregoing, the board states that in its opinion it is advisable for the United States to modify and combine the project for Pascagoula River and Horn Island Pass into a single project for improving the harbor at Pascagoula, Miss., so as to provide for a channel 150 feet wide, with greater width at sharp bends, and 22 feet deep from the railroad bridge at Pascagoula to a point on Dog River 4 miles above its mouth, below said bridge a channel 225 feet wide and 22 feet deep to Horn Island Pass, and a channel 300 feet wide and 25 feet deep across the outer bar, at an estimated cost of $383,030 for original excavation and $50,000 per year for maintenance, the work to be done by Government plant, provided, however, that local interests will give assurances satisfactory to the Secretary of War that they will contribute toward the cost of this work the sum of $100,000, to be paid in five annual installments of $20,000 each, and provided further that the local interests furnish space for public wharves both at Moss Point and at Pascagoula 800 feet in length and of such width as may be satisfactory to the Secretary of War. It is recommended that the initial appropriation be $180,000, and that $80,000 be appropriated thereafter annually until the completion of the project.

Except as noted above, there are no questions of water power, terminal facilities, or other subjects which may be so coordinated with the work as to lessen the cost thereof and compensate the Government for expenditures made in the interests of commerce and navigation.

For the board:

Wm. T. Rossell,
Colonel, Corps of Engineers,
Senior Member of the Board.

BIG SUNFLOWER RIVER, MISS.

The project adopted in the river and harbor act of 1912 is based on the following report of the Board of Engineers, printed in Rivers and Harbors Committee Document No. 2, Sixty-second Congress, second session:

War Department,
The Board of Engineers for Rivers and Harbors,
Washington, D. C., August 22, 1911.

Sir: Under date of January 26, 1909, the Committee on Rivers and Harbors of the House of Representatives forwarded to the Chief of Engineers for transmittal to the Board of Engineers for Rivers and Harbors the following resolution:

"*Resolved*, That the Board of Engineers for Rivers and Harbors be requested to make a reexamination of the Big Sunflower River, Mississippi, under the order of survey contained in the river and harbor act of March 2, 1907, with a view to determining whether an improvement of the river by open-channel work and the construction of one lock and dam is desirable."

This resolution was received by the board January 29, 1909, and on February 1 the board requested that the district officer be called upon for a report to include such information, estimates, maps, profiles, etc., as in his opinion were essential to a full understanding of the case. Such a report was submitted by the district officer under date of November 10, 1909, and on July 31, 1911, he submitted a supplemental report containing additional information requested by the board.

On April 6, 1910, the board through a committee of its members held a public hearing at Vicksburg in reference to this subject, and then proceeded up the river on an inspection trip which was concluded April 8 at Peter Mintons Ferry. The act of March 2, 1907, referred to in the resolution, provided for an examination of "Big Sunflower River from near Baird to the mouth of the Hushpuckena River, with a view to obtaining continuous navigation by locks and dams * * *." In that report the district officer submitted a plan involving the construction of three locks and dams at an estimated cost of $600,000, and the board reported that in its opinion the commerce involved was not sufficient in amount to warrant so large an expenditure.

The present investigation is to determine whether an improvement of the river by open-channel work and the construction of one lock and dam is desirable. The stretch of river between Woodburn, just below Baird, and the Hushpuckena River, about 90 miles, may be divided into two sections on account of the difference in the average low-water slope in each. The lower section, from Woodburn to Pentecost, 3 miles above Jones Bayou, a distance of 43 miles, has a slope averaging about 5¼ inches per mile, while the upper section, between Pentecost and Hushpuckena River, a distance of 47 miles, has a slope only of about 1¾ inches per mile.

In his report of November 10, 1909, the district officer suggested a lock and dam to be located near Woodburn, which would afford slack-water navigation up to Jones Bayou, and open-channel work for the section between Jones Bayou and Hushpuckena River. The estimated cost of the lock and dam is $300,000, and of the open-channel work, including dredging and contraction work, $50,000, making the total $350,000. While this plan of improvement would not be as complete and satisfactory as by the three locks and dams originally suggested, the district officer and the division engineer recommend it if the larger project be considered too costly.

In the report of July 31, 1911, made after more extended surveys and investigations, the district officer recommends that the location of the lock be moved downstream to the foot of Hollywood Bar, a distance of about 9 miles, as the pool would afford access to Dawson Lake, along which there are many plantations, would give deep water over three bars which would otherwise require additional work, and less excavation for the lock would be required than if located at Woodburn.

In response to a request for information by the board covering the status of the improvement on the river below Baird and the probable cost of completing it, the district officer reports that with the lock and dam located at the foot of Hollywood Shoals but six bars with an aggregate length of 4,600 feet would have to be dredged in order to secure a 4½-foot navigation, and that this could be effected at a cost of $30,000, which should be appropriated at the rate of $10,000 per year for three years, after which $5,000 per year would be required.

There is quite a large and valuable commerce on the lower river and this extends upstream as far as navigation is practicable. It is reported that about 95 per cent of the land bordering the river is under cultivation. The soil is very fertile and produces a large tonnage in cotton. Freight rates are much higher by rail than by water, and it is believed that the extension of continuous navigation to the mouth of the Hushpuckena would result in material benefits to the public at large. It is therefore the opinion of the board that Big Sunflower River is worthy of improvement to the mouth of the Hushpuckena River by the construction of one lock and dam and by open-channel work at a cost of $350,000, provided the land necessary for the lock and dam be furnished the United States free of cost and that assurances be given that the General Government will be subject to no flowage claims. The first appropriation should be $100,000, with authority to enter into contract for the balance with a view to completion in three years.

No questions of terminal facilities, water power, or other related subjects can be coordinated with the improvement proposed so as to lessen the cost to the United States.

For the board:

Very respectfully,

Wm. T. Rossell,
Colonel, Corps of Engineers,
Senior Member of the Board.

The Chief of Engineers, United States Army.

See also report on Yazoo River, Tallahatchie, Coldwater, and Big Sunflower Rivers, Tchula Lake, Steele and Washington Bayous, and Lake Washington, and Bear Creek, Miss.

PASCAGOULA, LEAF, AND CHICKASAHAY RIVERS, MISS.

(*a*) *Pascagoula River* (*above the mouth of Dog River*).—Pascagoula River is formed by the junction of the Leaf and Chickasahay Rivers in the southern part of the State of Mississippi, near the town of Merrill, and flows in a southerly direction, emptying into Mississippi Sound at Pascagoula. This improvement is limited to that part of the river above the mouth of Dog or Escatawpa River, and is 82.11 miles in length. Dog River flows into Pascagoula River 6.8 miles above the mouth of the latter. The width of this stream varies from 250 to 350 feet at mean low water.

Originally navigation of this part of Pascagoula River was impossible except during periods of high water. The minimum width of the channel was 60 feet and the minimum depth was 1 foot at mean low water, the stream being very much obstructed by logs and snags.

The first project for this improvement, which was adopted in 1880, in addition to providing for dredging work at the mouth, described in the preceding report on Pascagoula River, Miss., contemplated the improvement of the river above by the removal of snags and overhanging trees. Under this project the river was cleared of obstructions between 1882 and 1884, at a cost of $15,000, since which time funds have been applied to maintenance.

The river and harbor act of March 3, 1899, made a separate appropriation for the work of removing obstructions from Pascagoula River above the mouth of Dog River. Since that time this has been considered a separate improvement, and appropriations have been made accordingly.

Report of the examination upon which this project was originally based is printed in the Annual Report of the Chief of Engineers for 1879, page 835.

The preliminary examination and survey of Leaf and Pascagoula Rivers, called for by the river and harbor act of March 3, 1909, were made and reports thereon will be submitted to Congress at its present session.

For information as to reports on other examinations and surveys of the Pascagoula River, see report immediately preceding this one.

The existing project provides for maintenance of the channel above Dog River by the removal of obstructions from time to time.

The nonpropelling snag boat *Escatawpa*, which during the earlier part of the season worked on the Leaf River until funds were practically exhausted, commenced work on Pascagoula River at Merrill, Miss., November 15, 1911, and worked downstream about 10 miles, removing snags, logs, and overhanging trees until December 14, when funds were almost exhausted. A rise in the river stopped the work. During this time 1,193 obstructions were removed from the river, clearing 10 miles of the channel. Expenditures amounted to $1,993.60.

From the mouth of Dog River up to Dead Lake, 32 miles, a draft of 7 feet at mean low water can be carried; from this point up to the head of the river, 50 miles, a channel of about 3 feet depth and 60 feet width at mean low water has been obtained. This stream is affected by the tide as far up as Dead Lake. Freshets cause a variation of 25 feet in water level at Merrill, Miss.

The total amount expended on the improvement to June 30, 1912, was $53,470.24, of which $38,470.24 was applied to maintenance.

Commerce originating on Pascagoula River above the mouth of Dog River during the calendar year 1911 amounted to 301,538 short tons, principally logs, crossties, charcoal, and general merchandise, valued at $1,488,500.

The project has effected a reduction in rail rates for carload shipments of lumber from Merrill, Miss., to the coast during the past year.

Available funds and future appropriations will be applied to removal of obstructions in preservation of the improvement.

(*b*) *Leaf River.*—The source of this river is in the southern part of Mississippi. The stream is about 135 miles long. The head of the improvement is at the mouth of Bowie Creek, near Hattiesburg, Miss. The river flows in a southeasterly direction to its junction with the Chickasahay at Merrill, Miss., these two streams forming the Pascagoula River. The length of the section of river under improvement is 78.85 miles, and the width ranges from 180 to 230 feet at mean low water.

Originally it was impracticable to navigate this river on account of snags, logs, and overhanging trees. The minimum width was 100 feet and the minimum depth 2½ feet at mean low water.

The original project for this improvement was adopted in 1890, its purpose being to afford a channel for high-water navigation from Bowie Creek to the mouth of the river, a distance of 78.85 miles, by the removal of obstructions and overhanging trees. This project was completed in 1897 at a cost of $11,019.04, since which time expenditures have been in the direction of maintaining the improvement.

This project was based on an examination, the report of which is printed in Annual Report of the Chief of Engineers for 1889, page 1462.

No change has been made in the project as originally adopted, all work now being applied to maintenance of improvement.

The nonpropelling snag boat *Escatawpa* was at work on this improvement 7 miles below the mouth of Bowie Creek at the beginning of the past fiscal year, and continued working downstream for 21½ miles removing snags, logs, and overhanging trees until November 6, 1911, when, on account of near exhaustion of funds, she was transferred to Pascagoula River. Operations on Leaf River resulted in the removal of 2,418 obstructions, and expenditures during the fiscal year amounted to $4,417.09.

The total amount expended on this improvement up to June 30, 1912, was $34,202.20, of which $23,183.16 was applied to maintenance.

The maximum mean low-water draft that could be carried over the improvement on June 30, 1912, was 2 feet, and the minimum width of the channel was 100 feet, but the river is much obstructed with logs, snags, and stumps. At the mouth of Bowie Creek the variation in the river surface during the past seven years has averaged 18 feet.

The commerce of Leaf River during the calendar year 1911 amounted to 167,120 short tons, principally logs and timber, valued at $691,000.

This project has no present effect on freight rates, but it is claimed that if continuous navigation were rendered practicable, the effect on railroad rates would be marked.

It is proposed to apply the funds estimated as a profitable expenditure during the fiscal year ending June 30, 1914, to removal of obstructions in maintenance of the improvement.

In addition to the funds available at the beginning of the past fiscal year for work on this improvement $3,000 was transferred from the Chickasahay River allotment to this work, which was considered much more urgent.

(*c*) *Chickasahay River.*—The source of this river is at Enterprise, Miss., about 205 miles above its mouth. The stream flows in a southerly direction, following closely the eastern boundary of the State of Mississippi, and joins with the Leaf River to form the Pascagoula River at Merrill, Miss. The upper limit of the improvement is about 75 miles above its mouth at Bucatunna, Miss. The width of the channel varies from 50 to 150 feet at mean low water.

The original condition of this river was such that it was navigable for small rafts only during high water, and even navigation of this character was troublesome and dangerous. The minimum width of the channel was 50 feet and the minimum depth 6 inches at mean low water, the river being badly obstructed by logs and snags.

The original project for the improvement was adopted by the river and harbor act of September 19, 1890, and provided for obtaining a high-water channel from the mouth of the river up to Shubuta, Miss., a distance of 130 miles, by the removal of obstructions from the channel and overhanging trees from the banks. The river and harbor act of June 3, 1896, modified this project by limiting the improvement to that part of the river between the mouth and Bucatunna, Miss., about 75 miles. The project further provided for the maintenance of the improved channel. The project, as modified, was completed in the latter part of 1896, at a cost of $12,399.73.

The project was based on an examination made in 1888, report of which is printed in Annual Report of the Chief of Engineers for 1889, page 1463.

The existing project was adopted in the river and harbor act of March 3, 1905, and provides for maintaining the channel in Chickasahay River from the mouth to Bucatunna, Miss., by the removal of logs, snags, and other obstructions from the waterway, in order to keep the river in navigable condition for rafting at high-water stages, at an annual cost of $2,500. This project is based on an examination, report of which is printed in House Document No. 230, Fifty-eighth Congress, second session. This document does not contain a map. Also printed in Annual Report of the Chief of Engineers for 1904, page 1855.

No work was done here during the past fiscal year. Expenditures, amounting to $250, were applied to care and preservation of public property and office expenses.

The total amount expended on the improvement to June 30, 1912, was $25,174.21, of which $12,774.48 was applied to maintenance of improvement.

A high-water channel has been provided by this improvement and is used almost exclusively by logs and rafts. It is navigable for such on a rise of 4 to 6 feet above mean low water. The variation of the water surface is as much as 25 feet at the mouth of the river.

Commerce on this river in the calendar year 1911 amounted to 71,015 short tons of logs and timber, with a small amount of general merchandise, valued at $318,750.

Of the funds available at the beginning of the past fiscal year, $3,000 was transferred to the Leaf River.

The project has no effect on freight rates.

Consolidated.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$14,000

PEARL RIVER BELOW ROCKPORT, MISS.

The source of Pearl River is in the north-central part of the State of Mississippi. It flows in a southwesterly and then in a southerly direction for a distance of about 485 miles, emptying into the Rigolets, in eastern Louisiana. The section under improvement runs from Rockport, Miss., to the mouth, 246 miles. The lower part is divided into two principal streams, known as East Pearl River and West Pearl River. The former empties into Mississippi Sound near Dunbar, La., and the latter into the Rigolets, which connect Lake Borgne and Lake Pontchartrain, and is the section included in the improvement.

The limits of this improvement originally extended from the mouth of the river to Jackson, a distance of 313 miles. By act of Congress of April 21, 1900, the construction of a fixed highway bridge across Pearl River at Rockport was legalized. The point thereby became the head of navigation on the lower river for boats of any considerable size and the upper limit of the project. However, the bridge at Rockport was washed away in February, 1906. The distance from Jackson to Rockport is 67 miles.

Prior to improvement the condition of the river was such that it was not navigable except during high-water stages, and even then navigation was difficult and dangerous.

The original project for this improvement was adopted in 1880, and provided for a channel of navigable width and 5 feet deep at low water, by the removal of snags and sunken trees from the river bed and overhanging trees from the banks, at an estimated cost of $95,940. This project having been found to be impracticable, it was modified in 1885 so as to provide for a 2-foot channel at low water throughout this section of the river, at an estimated cost of $145,940.

With past appropriations the river has been improved until it became navigable for light-draft boats on a slight rise up as far as Monticello, about 211 miles above the mouth. Above Monticello the river has never been navigable except on a rise of 7 feet or more.

Report dated November 6, 1909, of an examination of Pearl River from Rockport to Jackson, Miss., is printed in House Document No. 468, Sixty-first Congress, second session.

The existing project provides for a 2-foot channel at mean low water from Rockport, Miss., to the mouth, 246 miles, by the removal of snags and overhanging trees.

At the beginning of the fiscal year the snag boats *Pearl* and *Black Warrior* were at work on the river, continuing until December 19, 1911, when operations were suspended on account of high water. The channel was worked over from the mouth of river upstream, going over 116½ miles of river previously worked, and completing 28¼ miles of original work under the project. Expenditures amounted to $14,603.32, of which about $10,000 was applied to maintenance work and the balance to original work.

The total amount expended on this improvement to June 30, 1912, was $244,343.86, of which $99,900.55 was applied to maintenance.

A maximum mean low water channel, 3 feet deep and 50 feet wide, now exists from the mouth of the river up 145 miles, and above this point to Columbia, a further distance of 10 miles, a maximum mean low water draft of 1½ feet can be carried; from here up to Monticello, 56 miles, the river can be navigated by light-draft boats on a slight rise above mean low water. Above Monticello the river has never been navigable except on a rise of 7 feet or more. The river at Columbia rises to a height of 21 feet above mean low water. Work under the existing project is about 43 per cent completed.

Commerce on this section of Pearl River during the calendar year 1911 amounted to 40,825 short tons of logs and timber, valued at $409,975.

The result of the work done has been to render Pearl River navigable for light-draft boats up as far as Columbia; and though the channel has been but little used, it is reported that very material cuts in freight rates on railroads have resulted.

Available funds and future appropriations will be applied to a continuation of work under the project, at the same time maintaining that part of the channel upon which original work has already been completed.

The snag boat *Black Warrior* having been found unsuited to snagging work in this district, her disposition by sale or transfer has been recommended, and in the item of $22,000 estimated as required for work of improvement during the fiscal year ending June 30, 1914, is included $12,000 which it is proposed to apply to the construction and equipment of a snag boat suited to the work on Pearl River below Rockport.

Amount (estimated) required to be appropriated for completion of existing project	$54,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	37,000

WOLF AND JORDAN RIVERS, MISS.

Originally the least depth on the bar at the mouth of Wolf River was something under 3 feet, and on the bar at the mouth of the Jordan River it was not quite 4 feet at mean low water.

The channel at the mouth of Jordan River extends from the 7-foot contour in the mouth of the river through the bar to the 6-foot contour in Bay St. Louis, 1⅝ miles; has a width of 100 feet at bottom and a depth of 7 feet at mean low water; and the channel at the mouth of Wolf River has similar dimensions, except that the length is 1½ miles. The Jordan River above the mouth has a width of about 250 feet, and is navigable for vessels drawing 7 feet for a distance of

16 miles; the Wolf River above the mouth is about 225 feet wide and is navigable for 7-foot draft for about 20 miles. This improvement is about 24 miles west from Gulfport, Miss.

The present and only project was adopted by the river and harbor act of March 2, 1907, and provides for the formation of a channel 7 feet deep and 100 feet wide at bottom, with side slopes of 1 on 6, across the bar at the mouth of each of the streams named, from the 7-foot curve of depth in the river to the 6-foot contour in Bay St. Louis, at a cost of $30,000 for completing the work and $5,000 per annum thereafter for maintenance. After reaching the 6-foot contour in the bay the material becomes so soft that a draft of 7 feet can easily be carried through it.

This project was completed at a cost of $29,195.19. Expenditures since have been for maintenance.

The report of the examination and survey upon which the project is based is printed in House Document No. 917, Fifty-ninth Congress, first session, and it contains a map.

Reports of previous examinations are printed in the Annual Report of the Chief of Engineers for 1893, pages 1787 and 1789.

No modification has been made in the existing project since its adoption.

No work was done on this improvement during the past fiscal year, as there were no funds available for the purpose.

The total amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $35,000, of which $5,804.81 was applied to maintenance.

The maximum draft that can be carried over the shoalest part of the channel at the mouth of Jordan River is 7 feet, and at the mouth of Wolf River is 7 feet.

The average range of tide at this locality is 1¾ feet.

Commerce on these two streams during the calendar year 1911 amounted to 50,742 short tons of lumber, rosin, turpentine, and general merchandise, valued at $1,049,300.

The improvement has been of immediate and considerable local benefit, but is believed to have had little, if any, effect on freight rates.

It is proposed to apply the funds estimated below as a profitable expenditure during the fiscal year ending June 30, 1914, to work of dredging with Government dredge in maintenance of the improvement.

Amount appropriated by river and harbor act approved July 25, 1912	$5,000
Amount available for fiscal year ending June 30, 1913	5,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 5,000

MOUTH OF YAZOO RIVER AND HARBOR AT VICKSBURG, MISS.

The shifting bar at the former mouth of the Yazoo was the most serious obstruction to navigation of that river and its tributaries, a system comprising about 800 miles of navigable waterways. At low stages steamboats were prevented from entering or leaving the river without lightering their cargoes across the bar, and it frequently happened that the outlet was entirely closed to navigation throughout the busiest season of the year.

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[1] Exclusive of amount available for fiscal year 1913.

Prior to 1876 the city of Vicksburg possessed the most commanding site and the finest harbor on the Mississippi River. There was deep water along the city front, and the entire width of the river was available for steamboats at all stages, with not less than 25 feet depth in any part of the harbor. The cut-off of April 27, 1876, and subsequent shoaling of the old channel from the river to the front of the city practically destroyed the harbor, which became unnavigable except at high stages.

The original project for improving Vicksburg Harbor was entered upon under the river and harbor act of June 18, 1878. The first work consisted of revetting the rapidly caving bank at Delta Point, La., opposite Vicksburg, the continued recession of which was increasing the distance from the harbor to the river channel. The river and harbor act of August 2, 1882, placed the work under the Mississippi River Commission, and the revetment at Delta Point was continued. The amount expended at Delta Point was $389,486.08.

When Vicksburg Harbor was placed under the Mississippi River Commission in 1882 a project was adopted for dredging a basin 1,700 feet long by 300 feet wide in front of the city, with a canal 150 feet wide to connect it with the river. Dredging under this project amounted to 250,035 cubic yards in 1883, when discontinued. It was resumed in 1888, under a slightly modified project, and continued until 1893. During the latter period the dredging amounted to 1,729,994 cubic yards, making a total of 2,080,029 cubic yards of excavation. In 1888 pile dikes were built at the north end of the basin and along the west side of the canal, aggregating 6,800 feet in length. The expenditures for Vicksburg Harbor were $442,724.77, which, added to the amount expended at Delta Point, makes a total of $832,210.85. The improvement of Vicksburg Harbor was transferred to the Engineer Department under a provision of the river and harbor act of August 18, 1894.

The project, adopted by Congress in the river and harbor act of July 13, 1892, contemplated opening a new mouth or outlet for Yazoo River from its original mouth on Old River (9.8 miles above the former outlet to the Mississippi) through deep water down the wrong end of Old River, thence across a neck of low land between Old River and Lake Centennial, and around the head of De Soto Island and down the east arm of Lake Centennial to the Mississippi River, entering it upon the channel side at Kleinston Landing.

Lake Centennial is the old bend of the Mississippi River cut-off in 1876, and De Soto Island, prior to the cut-off was the Louisiana Peninsula around which the river flowed. Vicksburg Harbor is that part of the river along the city front of Vicksburg. The distance from head of the main cut to Kleinston Landing is 6.3 miles. Dredging operations have extended above the head of the main cut up Old River 0.9 mile. The original estimate of cost—$1,500,000—was revised in 1893 and reduced to $1,200,000.

The existing project is for maintenance, and the cost has varied between $2,500 and $22,000 a year, the average cost being about $6,000 per year.

The project was completed in 1905, at a cost of $1,179,210.87. Subsequent expenditures for maintenance amount to $54,432.94. The new outlet was opened in the spring of 1903. Uninterrupted navigation of Vicksburg Harbor has been maintained for nine years, and the new mouth of Yazoo River has been open to boats of 6 feet draft at mean low water. The extreme range between high and low water at Vicksburg is 59 feet, but the usual variation is about 45.3 feet.

The chief features of this work were the purchase of 1,155.54 acres of land for right of way of the main cut from Old River to Lake Centennial; the clearing and grubbing of the entire route; the excavation by dredging of 6,229,281 cubic yards of earth in opening the new outlet, of which about 934,000 cubic yards was used for building a dam, above ordinary low water, across the west arm of Lake Centennial from mouth of the main cut to head of De Soto Island, and constructing a levee containing 429,677 cubic yards from mouth of the canal at Kleinston westward along West Pass Bar (which separates the west arm of Lake Centennial from Mississippi River) to within about 4,500 feet of King Point.

The annual commerce of Yazoo River, its tributaries, and Vicksburg Harbor, as reported for seven years, varied between 222,792 and 441,765 tons, the estimated values of which ranged from $6,801,000 to $13,272,000 per annum. The average of the commerce was 321,594 tons per annum, and the average value $8,753,650.

The effect of the project, in conjunction with the work performed in Yazoo River and tributaries, has been to reduce freight rates, as follows: Cotton, about 50 per cent; cotton seed, about 33⅓ per cent; live stock, about 66⅔ per cent; and grain, flour, meal, and provisions, from about 33⅓ to 40 per cent. Rates to inland points, where there is no water competition, indicate that existing freight rates would advance materially if navigation was permanently suspended.

The available balance will be applied to work for maintenance of the improvement by dredging and for repairs and protection of West Pass Levee, etc. The additional appropriation recommended for the fiscal year 1914 will be required for maintenance of the work. A survey made in 1911 along the Mississippi River front of West Pass Levee indicated that revetment of the river bank would be required to stop caving at that locality. Continued disturbance of the regimen of the Mississippi River above Vicksburg will necessitate the construction of this revetment to prevent the destruction of the West Pass Levee and consequent loss of the improvement attained at great cost. The estimated cost of the revetment is $120,000, and $10,000 additional should be provided for dredging, etc., required in Old River and Lake Centennial.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$130,000

YAZOO, TALLAHATCHIE, COLDWATER, AND BIG SUNFLOWER RIVERS, TCHULA LAKE, STEELE AND WASHINGTON BAYOUS, AND LAKE WASHINGTON, AND BEAR CREEK, MISS.

Yazoo River and its tributaries were consolidated by river and harbor act of June 13, 1902. The same kind of work is required in all, i. e., the removal of wrecks, snags, stumps, tree slides, sunken logs, leaning timber, etc., for maintenance of navigation.

(*a*) *Yazoo River.*—Yazoo River, about 178 miles long, is formed by the junction of Tallahatchie and Yalobusha Rivers, in Leflore County, Miss., flows first in a general southerly and then in a southwesterly direction, and enters the Mississippi River at Vicksburg.

Before improvement the period of navigation was limited to high stages on which steamboats could pass the wrecks of gunboats, steamers, and raft sunk to bar navigation during the Civil War. The channel was much obstructed also by snags, stumps, tree slides, leaning timber, etc.

The project entered upon in the river and harbor act of March 3, 1873, contemplated removing the obstructions to give ease and safety to navigation. Subsequent acts of Congress provided for continuing the improvement and for maintenance. There is no practical distinction between improvement and maintenance, as floods, sliding and caving banks, and the rapid growth of vegetation along alluvial streams of this kind constantly add obstructions and render a continuance of snagging operations necessary in the interest of safe and uninterrupted navigation. The estimated cost of this work is about $15,000 a year.

During the fiscal year ending June 30, 1912, snagging operations for maintenance extended over the river from mouth to head and kept it in good navigable condition.

The wreck of the steamer *Mary H. Miller* at lower end of Whites Bar, near Yazoo City, was removed by a snag boat November 18–20, 1911. The cost of this work, $64.87, was reimbursed the United States by the owner of the wreck, under section 20 of the river and harbor act approved March 3, 1899.

The total expenditure to June 30, 1912 (including $618.98 derived from sales), was $445,342.39, which has resulted in safe and uninterrupted navigation from mouth to head of the river the year round. Steamboats of 3½ feet draft navigate the river at mean low water without serious difficulty.

The chief shipments of Yazoo River and tributaries are cotton, cotton seed, staves, timber, etc., with return freights of general merchandise and plantation supplies. The commerce of 21 years ranges between 102,098 and 544,503 short tons annually, with values estimated at $2,840,000 to $9,198,000, the average being 254,869 short tons, valued at $5,706,763.

Freight rates on cotton by boat are about 50 per cent less than by rail; on cotton seed about 33⅓ per cent less. Live-stock shipments by boat cost about one-third of the railroad rates, and grain, flour, meal, and provisions shipped by boat cost about 50 per cent less than by rail. To inland points the railroad rates are largely in excess of boat rates for the same distance. Large quantities of timber are rafted which could not be reached by rail.

The range between high and low water at Yazoo City is 40.8 feet.

It is proposed to apply the available funds to continuing work for maintenance of the improvement.

The amount required for expenditure in the fiscal year ending June 30, 1914, will be applied to removal of snags, overhanging trees, drift, etc., and operation of snag and dredge boats, for maintenance and extension of benefits.

(*b*) *Tallahatchie and Coldwater Rivers.*—Tallahatchie River has its source in Tippah County, northern Mississippi, flows in a general southwesterly direction until joined by Coldwater River in Quitman County, and then in a southerly direction, uniting with the Yalobusha, a few miles above Greenwood, in forming Yazoo River. It is about 230 miles long. The section included in this project, from its mouth upstream to the mouth of Coldwater River, is about 121 miles.

Coldwater River has its source in Marshall County, northern Mississippi, flows southwesterly and then southerly to its junction with the Tallahatchie. It is about 125 miles long. The section included in this project, from its mouth upstream to Yazoo Pass, is about 40 miles.

Before improvement Tallahatchie River was navigable to Sharkey, about 65 miles above its mouth, for six months of the year, but passage was difficult and dangerous on account of the number of obstructions in the channel and along the banks and the wreck of the ocean steamship *Star of the West*, sunk February, 1863, 8 miles above the mouth. Above Sharkey the growth of leaning timber was so dense and the channel so obstructed by snags, etc., that that part of the stream practically was unnavigable. The same conditions continued up the Coldwater River.

The project entered upon in the river and harbor act of March 3, 1879, contemplated removing obstructions in Tallahatchie River between its mouth and the mouth of Coldwater River and up the Coldwater to Yazoo Pass. Work in Coldwater was abandoned in 1881, but was resumed under a provision of the river and harbor act of March 3, 1905.

The existing project is for maintenance of the improvement from Yazoo Pass on the Coldwater to the mouth of Tallahatchie River at a cost of about $10,000 a year.

During the fiscal year ending June 30, 1912, operations for maintenance extended from the mouth of Tallahatchie River upstream about 90 miles. A large number of snags, leaning trees, and other obstructions were destroyed, and the stretch worked over was placed in reasonably safe condition for navigation for the time.

The amount expended to June 30, 1912 (including $40 derived from sales), was $107,946.35, and the work performed permits steamboats of 3 feet draft to run to Sharkey the year round and into Coldwater River at moderately high stages.

Marks, on Coldwater River, is considered the present head of navigation, and boats rarely run above that place.

The commerce of 1911 consisted of 40,642 short tons, chiefly cotton seed, saw logs, grain, and cotton, valued at $1,914,716. For statement of effect of project on freight rates, see Yazoo River report preceding.

The commerce of Coldwater River is of little importance and is decreasing.

The estimate for the fiscal year 1914 is for maintenance and extension of benefits.

(*c*) *Tallahatchie River above mouth of Coldwater River to Batesville.*—To comply with requirements of river and harbor acts of 1880, 1881, and 1882, a total expenditure of $10,000 was made to clear this stretch of about 45 miles of leaning trees, stumps, and snags, after which work was discontinued by the United States.

The existing project entered upon March 2, 1907, contemplated an expenditure of $2,000 a year for a series of years to put the river in such condition that boats plying the lower Tallahatchie River could safely run to Batesville for five to seven months of the year, eventually the cost of maintenance to be reduced to $1,000 per year during the period of low water. During the high-water season expenditures were made for repairs of plants preparatory to resuming operations for maintenance when a favorable stage is reached.

The total amount expended to June 30, 1912, was $18,597.38, of which $8,597.38 was applied to maintenance under the existing project. The work was resumed in May, 1907, after a lapse of 25 years and was continued downstream to the mouth of Coldwater River. The chief obstructions to navigation were removed and the stretch placed in fairly good navigable condition.

The commerce is of little importance and decreasing. The available balance will be expended for maintenance.

(*d*) *Sunflower River*.—This river has its source in Mud Lake, Coahoma County, Miss., near Friar Point, flows in a general southerly direction, and enters Yazoo River about 45 miles above its mouth. It is about 216 miles long. The section included in the project, below the mouth of Hushpuckena River to Yazoo River, is 171.2 miles.

Before improvement the river was navigable about six months of the year, but was obstructed by snags, logs, sand bars, and shoals; navigation was impeded by leaning timber, and at many places the channel was so choked with obstructions and so narrow that it afforded passage for the smallest craft only.

The project entered upon in the river and harbor act of March 3, 1879, contemplated the removal of obstructions between the mouth and Clarksdale, about 196 miles, and the building of inexpensive pile and brush wing dams to scour depths of about 40 inches at the bars. Prior to the building of the Mississippi River levees, and since, when crevasses in the levees occurred, this stream carried large quantities of overflow water and its section was increased thereby. In this enlarged bed the normal river at low stages now flows between secondary banks and, as a rule, the main banks are not overtopped by floods, except near the mouth, where the flood height is affected by backwater from the Mississippi.

On account of the changed conditions, the river and harbor act of March 2, 1907, placed the upper limit of improvement at the mouth of Hushpuckena River, about 25 miles below Clarksdale; authorized a continuation of the work of removing obstructions below that point and an improvement of the lower section below Baird, 97 miles, with a view to obtaining a navigable depth of 3 feet by means of the closure of outlets and more extensive contraction works. The estimates of cost for work below Baird were $75,000 for the necessary closing dams, about $10,000 per year for five years for continuation of the open-river work, and $5,000 per year thereafter. This was the existing project at close of the fiscal year ending June 30, 1912.

The project adopted by the river and harbor act approved July 25, 1912, is based on examination and survey reports and the plans contained in House Document No. 1251, Sixtieth Congress, second session, and House River and Harbor Committee Document No. 2, Sixty-second Congress, second session (maps not printed), which contemplate the construction of a lock and dam at the foot of Hollywood Bar, 74 miles above the mouth of the river, at an estimated cost of $300,000; open-channel work and dredging below the mouth of Hushpuckena River, an estimated cost of $50,000. The act makes an appropriation of $75,000 for the lock and dam. A continuing-contract provision for the balance of $225,000 for the lock and dam is recommended.

The amount that can profitably be expended during the fiscal year ending June 30, 1914, in addition to available funds, is $120,000 for the lock and dam and $10,000 for open-channel work and dredging from the mouth of the river to the proposed site of the lock and dam.

During the fiscal year ending June 30, 1912, operations for maintenance were continued as follows: Snagging work and the construction and repair of wing dams for maintenance extended over a stretch of 52 miles, between Vick Landing, 6 miles below Baird, and Holland Landing, 39 miles above the mouth, putting it in safe navigable condition for the time. Dredging in the lower 66 miles of the river, between its mouth and Osceola Bar, was continued. Three cuts were made at One Mile Crossing, Callao Landing, and below Osceola Bar, 45 feet wide, 4½ feet deep, aggregating 2,325 feet in length, from which 8,600 cubic yards of material (bucket measurement) were removed.

The amount expended to June 30, 1912, was $223,543.82. The cutting of leaning timber, removal of channel obstructions, and the building and renewal of wing dams at the bars maintained navigation. The chutes in lower Big Sunflower River were closed by levee embankments in 1908–9. The maximum draft at low water that could be carried June 30, 1912, in the stretch of river from just below the mouth of Hushpuckena River to Woodburn, 84 miles above the mouth, was 2 feet. Below Woodburn to the mouth of the river the depth had been increased from 30 inches to 3 feet by the closure of outlets, construction of wing dams, and dredging.

A résumé of the work performed was given in the Report of the Chief of Engineers for 1896, page 1630. Subsequent reports of the district officers contain each year's operations only.

The mouth of Hushpuckena River is considered the head of navigation.

There is quite a large and valuable commerce of cotton, cotton seed, lumber, live stock, saw logs, etc., with return freights of general merchandise and plantation supplies, amounting in 1911 to 92,468 short tons, valued at $1,170,059. This extends upstream as far as navigation is practicable, and is increasing, as about 95 per cent of the land bordering the river is under cultivation.

Freight rates are much higher by rail than by water, and it is believed that the extension of continuous navigation to the mouth of the Hushpuckena will result in material benefits.

It is proposed to apply the available funds pertaining to project of 1879, with modifications, to a continuance of snagging and dredging operations, building and repair of wing dams, etc., to maintain the improvement accomplished and extend its benefits.

Project of 1912 (lock and dam).

Amount (estimated) required to be appropriated for completion of existing project	$275,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	120,000

(*e*) *Tchula Lake.*—This is an arm of Yazoo River, about 60 miles long, and east of Honey Island, in Holmes County, Miss. Before improvement navigation was obstructed its entire length by a network of snags in the channel and by heavy leaning timber and a thick growth of brush along both banks.

The project adopted in the river and harbor act of March 3, 1881, contemplated removal of the obstructions to prolong the period of navigation and to permit light-draft steamboats to pass through the lake earlier in the cotton season. The work was completed in 1896 (Report Chief of Engineers, 1895, p. 1942), when operations were discontinued. The river and harbor act of June 13, 1902, and subsequent acts contained provisions for maintenance.

During the fiscal year ending June 30, 1912, operations for maintenance extended from the head of the lake downstream about 36 miles to Black Creek.

The work was practically completed and the stream put in safe navigable condition in 1896, at an expenditure of $21,000. Since 1902, $15,305.98 has been expended for maintenance. The total amount expended to June 30, 1912, was $36,305.98.

The commerce is limited and is not increasing. In 1911 it amounted to 564 short tons of cotton, cotton seed, live stock, and provisions, valued at $60,500.

Water rates of transportation are lower than by rail.

The available funds and the additional amount recommended for expenditure in the fiscal year 1914 are to be applied to continuing snagging work for maintenance.

(*f*) *Steele and Washington Bayous and Lake Washington.*—Steele Bayou has its source in Swan Lake, Washington County, Miss., flows in a general southerly direction, forming the outlet of Lake Washington, with which it is connected by Washington Bayou, about 7 miles in length, and enters Yazoo River 1.6 miles above Old River, near the head of the Yazoo diversion route. The section included in the project—from Glen Allan, on Lake Washington, to the mouth of Steele Bayou—is about 60 miles.

Before improvement the lower part of Steele Bayou was navigable for small boats at high stages of the Mississippi River, when the flood water was backed up into the bayou, but navigation was dangerous and obstructed by leaning trees and by snags, stumps, drift, etc.

The project entered upon in the river and harbor act of July 5, 1884, was based upon the report of an examination (without maps) printed in the Report of the Chief of Engineers for 1884, page 1360, and contemplated removal of the obstructions in Steele Bayou to afford greater ease and safety to navigation and to extend its period and limits. The river and harbor act of August 5, 1886, included Washington Bayou in the project, the same kind of work being required in that stream to improve high-water navigation. This work was discontinued in 1896 after the expenditure of $12,500.

The existing project, adopted in the river and harbor act approved June 25, 1910, contemplated the removal of snags, logs, stumps, overhanging trees, etc., obstructing navigation of Steele and Washington Bayous and Lake Washington from the mouth of Steele Bayou to Glen Allan, on Lake Washington, in accordance with plan printed in House Document No. 904, Sixtieth Congress, first session. Most of these obstructions were added after work under the original project was suspended. The estimated cost of completing the work in five years was $15,000.

During the fiscal year ending June 30, 1912, operations were carried from a point about 7½ miles below Washington Bayou to the mouth of Steele Bayou, placing it in reasonably safe condition for high-water navigation for the time.

The total amount expended on the existing project to June 30, 1912, was $6,549.81. Work commenced in October, 1910, and in the two seasons since has extended over the waterways covered by the project, has resulted in greater ease and safety to navigation, but by reason of the limited funds available has not been thorough and should be repeated for several years at a cost of about $2,500 per year.

The commerce of 1911—cotton seed, lumber, and saw logs—amounted to 5,187 short tons, valued at $39,332. This was about one-half the amount and one-quarter of the value of the commerce of 1910. The commerce of Washington Bayou is of little value and not increasing.

The rates for transportation by water are much less than by rail. Present navigation is limited to occasional small tows propelled by gasoline boats.

The estimate for the fiscal year 1914 is for maintenance and extending the benefits.

(*g*) *Bear Creek.*—The stream known as Bear Creek is a succession of small lakes and creeks near the intersection of Leflore, Sunflower, and Washington Counties, Miss. It has its source in Mosquito Lake, about a mile south of Itta Bena, flows south, and enters Yazoo River at Wasp Lake Landing, about 6 miles above Belzoni. A straight line from head to mouth is a distance of only 20 miles, but owing to its irregular course its length is estimated to be about 90 miles. The navigable portion included in the project is about 25 miles long and extends through four lakes at the lower end, the connections between which are dry at low water and require a stage of 15 feet in Yazoo River to enable boats to run. Before improvement, navigation at favorable stages, which exist during an average of three months a year, was difficult, as the connecting watercourses had grown up with trees and brush.

The project, adopted in the river and harbor act approved June 25, 1910, contemplated cutting out the undergrowth which obstructed the 12 miles of watercourse connecting Threemile, Sixmile, Fourmile, and Wasp Lakes, to afford greater ease and safety to navigation at high stages, in accordance with plan printed in House Document No. 908, Sixtieth Congress, first session. The estimated cost of the work was $3,000, to be followed at end of about three years by an appropriation of $2,500 for maintenance.

The work was commenced in November, 1910, and was completed in December, 1911. The cost was greater than estimated, and amounted to $3,346.62. On account of the rapid growth of vegetation, operations should be repeated after a lapse of three years, if maintenance is desirable.

The commerce of 1910, carried by two barges, amounted to 362 short tons of cotton seed and provisions, valued at $23,635. No reports of freight traffic for 1911 were received.

Consolidated.

July 1, 1911, balance unexpended		$44,097.29
Amount received from sales of property		93.82
Amount received from reimbursement of cost of removing wreck		64.87
		44,255.98
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$1,795.46	
For maintenance of improvement	33,340.07	
		35,135.53
July 1, 1912, balance unexpended		9,120.45
July 1, 1912, outstanding liabilities		2,098.28
July 1, 1912, balance available		7,022.17
Amount appropriated by river and harbor act approved July 25, 1912		100,000.00
Amount available for fiscal year ending June 30, 1913		107,022.17
Amount (estimated) required to be appropriated for completion of existing project		[1]275,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914:		
For works of improvement		[2]120,000.00
For maintenance of improvement		[3]40,000.00
Total		[1,2]160,000.00

REMOVING THE WATER HYACINTH FROM FLORIDA WATERS.

Before improvement many Florida rivers, especially the St. Johns and its tributaries, were badly obstructed by packs of hyacinths. The first project, adopted March 3, 1899, provided for the construction of a boat and booms and for destroying the hyacinth by crushing. The estimated cost was $36,000, plus an undetermined amount for annual expenditure. Nothing was done under this project, as experience in Louisiana showed that destruction by crushing was impracticable.

In 1902 the existing project was adopted, providing for the destruction of the hyacinths by any means whatsoever. The plan adopted under this project was to spray the plants with an arsenical compound. The estimated cost of this work was $50,000 per annum.

Under this project the sum of $84,977.97 was expended. A steamer was purchased and fitted up for spraying, and the main stream of the St. Johns River and its tributaries were cleared of hyacinths.

The act of 1905 modified the project by prohibiting any process injurious to cattle. The plan of closing inlets, sloughs, etc., with booms, breaking up the packs with a suitable boat, and propelling them into the current in order that they might be carried where they would not cause an obstruction was in use until November, 1909, when a hyacinth elevator, consisting of a catamaran scow equipped with an inclined conveyer driven by a gasoline engine, was put in service. This method has proven quite satisfactory, and during the remainder of the fiscal year the St. Johns River was satisfactorily cleared of the plant so far as it was an obstruction to navigation.

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[1] Exclusive of amount available for fiscal year 1913.
[2] For lock and dam on Big Sunflower River.
[3] For open-channel work.

The existing project is therefore to remove the hyacinth by means of an elevator which either places the plants on shore or forms them in deep piles which are carried away by the currents.

No work was done during the year, no difficulty being experienced with hyacinths. Expenditures during the year were for maintenance and repair of plant and contingencies and amounted to $85.

The amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $126,474.23.

As a result of work previously done, the St. Johns River and Black Creek remained open for free navigation during the year. In the spring the hyacinths were found to be growing freely, and it will be necessary to resume operations early in the year to keep the river open.

It is proposed to use the amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, in continuing this work.

Amount (estimated) required to be appropriated for completion of existing project	Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$10,000

REMOVINR THE WATER HYACINTH FROM WATERS IN LOUISIANA AND TEXAS.

The water hyacinth is an aquatic plant which infests the waters of the Gulf coast, increasing with great rapidity during the summer season and greatly obstructing navigable waterways. It is a floating plant and is propagated not only by seed but by the development of new plants from the root stems or portions of the root. It made its appearance in the waters of southern Louisiana about 1884 and spread with such rapidity that it soon infested all of the streams where sufficient current does not exist to carry it to salt water.

The existing project for the destruction of these plants is based on a report submitted in 1898 (Report of the Chief of Engineers for 1899, p. 1615), was adopted in 1899, and originally contemplated the construction and operation of boats equipped with suitable machinery for removing and crushing the plants, and the use of log booms to prevent the plants from drifting from one stream into another, at an estimated cost of $25,000 for a boat, $10,000 for operation, and $1,000 for the establishment of log booms, a total of $36,000.

The act of June 13, 1902, authorized the use of mechanical, chemical, or other means whatsoever for the extermination of the plant, and under this provision the project was modified so as to destroy the plants by chemical instead of mechanical means. Continuation of operations for the removal and destruction of these plants was made possible by the appropriation of 1902 and later appropriations.

Under the existing project a boat with suitable machinery for removing and crushing the hyacinth, at a cost of $17,253.17, was secured and operated in 1900 and 1901 in Bayou Plaquemine, removing the plants at an operating cost of 4.9 cents per square yard. A log boom was also established at the mouth of Bayou Teche to prevent the plants from entering that stream from the Atchafalaya.

With the authorization of the use of chemical means to destroy the plants the use of crushing machinery was abandoned and the boat equipped with a spraying apparatus.

Spraying operations were carried on in 1902 in Bayou Plaquemine and adjacent waters, using the Harvesta chemical compound, a trade article, which proved effective in the destruction of these plants, the operating cost per square yard being 0.37 cent.

Spraying operations were also continued in the waters adjacent to Bayou Plaquemine in 1903 and 1904, and booms were placed in Bayou Plaquemine and several adjacent streams.

Alterations and repairs were made to the boat in 1904, and in 1905 spraying operations were resumed, using a solution prepared from a formula of the Department of Agriculture instead of the Harvesta compound.

This spraying solution is prepared by dissolving 1 pound of white arsenic and 1 pound of sal soda per gallon of water, by boiling for about an hour, and then diluting with about 17 gallons of water preparatory to spraying.

The cost of this solution is about one-tenth that of the Harvesta compound, and it is estimated that 1 gallon will destroy 10 square yards of hyacinths.

A second boat was purchased in 1905 and fitted for spraying the plants at a cost of $8,903.57, and since that year the work of removing the plants by spraying and the use of booms and watchmen has been carried on in those streams which are most obstructed or whose commercial importance demands that no obstructions be permitted to form.

The first boat secured for operations in the removal of these plants was dispensed with in 1908, having become unserviceable, and the second boat was overhauled in the same year and altered completely.

These various operations have resulted in removing the worst obstructions from year to year and keeping the most important waterways reasonably free from the hyacinths.

No reasonable amount of money expended can begin to eradicate the plants, however, without the cooperation of local officials and private parties, and even with such cooperation the complete eradication of the plants would be a long and difficult process.

Operations during the fiscal year have consisted in the operation of booms and patrol of streams by watchmen, the establishment of fixed booms at the mouths of small tributaries of navigable streams, and the spraying of the plants in the localities most congested and at the headwaters of navigable streams.

The overflow waters from the Mississippi River during the flood of the spring of 1912 carried a large majority of the water hyacinths in that section of Louisiana between the Mississippi and Bayou Teche to the Gulf of Mexico, and rendered operations in this territory unnecessary during the last few months of the fiscal year. However, sufficient plants were left in the swamps and at various points along the banks of the streams to insure their prompt return in large numbers, and it is doubtful if any permanent improvement will result.

The sum of $13,136.15 was expended during the fiscal year for maintenance.

To June 30, 1912, there has been expended on the existing project the sum of $158,940.04. There has been received from miscellaneous sources, sales, etc., the sum of $1,119.04.

The funds estimated for expenditure during the fiscal year 1914 will be applied to the removal of water hyacinths from the waterways in accordance with the adopted project, which is absolutely necessary to the navigation of many streams.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$15,000

BAYOU BARTHOLOMEW, BOEUF RIVER, TENSAS RIVER AND BAYOU MACON, AND BAYOUS D'ARBONNE AND CORNEY, LA. AND ARK.

These streams are tributaries of Ouachita River and are not navigable at low stages. The works were consolidated by the river and harbor act of June 13, 1902. The improvements are all of the same character, i. e., the removal of snags, wrecks, leaning timber, etc., to lessen the danger and lengthen the period of navigation. Drift, sliding and caving banks, and the rapid growth of vegetation constantly add obstructions.

(*a*) *Bayou Bartholomew, La. and Ark.*—This bayou has its source in Jefferson County, Ark., a few miles west of Pine Bluff; following a tortuous course, it flows first in a southeasterly direction nearly parallel to Arkansas River, then in a southerly direction, parallel to the Mississippi River, and, after entering Louisiana, turns to the southwest and enters Ouachita River in Morehouse Parish, opposite Ouachita, La., 140.5 miles below Camden, Ark. The length of the stream is about 300 miles. The section included in the project, below Baxter, Ark., to the mouth, is 182 miles. Before improvement it was navigable for light boats about three months of the year, but the passageway for steamboats was much obstructed.

The project adopted March 3, 1881, contemplated removing obstructions below Baxter to the mouth of the bayou. This project has not been modified, except that the plan for maintenance contemplates work between the mouth and McComb Landing, Ark., the present head of navigation, 41 miles below Baxter, at an estimated cost of about $4,000 a year.

The amount expended to June 30, 1912, was $73,730.78. The project was practically completed in 1897 to McComb Landing, Ark., the present head of navigation, 141 miles, at a cost of $45,873.53. This work resulted in safer navigation, increased the period to about six months of the year, enabled boats to make trips in half the time formerly required, and reduced freight rates about 50 per cent. There being no demand for navigation above McComb Landing, subsequent expenditures were for maintenance, and $27,857.25 has been applied to that purpose.

The commerce consists of shipments of cotton, cotton seed, staves, saw logs, etc., with return freights of general merchandise and plantation supplies. Much of the trade has been diverted to railroads, as the stages of the bayou frequently are not coincident with the needs of transportation. The commerce for 20 years prior to 1910 ranged between a maximum of 49,299 short tons in 1891 and a minimum of 1,502 short tons in 1907, the average being 11,585 tons, valued at $297,780. No commerce was reported in 1910 or 1911.

There is no record of freight rates on Bayou Bartholomew and the works consolidated with it available for making a comparison of the effect of the improvement. In a general way it may be stated that the rates have been greatly reduced; that traffic is no longer sufficiently lucrative to support the class of boats formerly plying in these streams, but it is now carried by smaller boats. This is largely due to competition of railroads, and boats now ply only where the rivers are the only shipping routes.

The appropriation recommended will be applied to removal of snags, overhanging trees, drift, etc., for maintenance.

(*b*) *Boeuf River, La.*—This river has its source in Chicot County, southeastern Arkansas, flows in a general southwesterly direction, and enters Ouachita River in Catahoula Parish, La., opposite Stafford, and 269.8 miles below Camden, Ark. It is about 300 miles long, and the section included in the project, below Wallace Landing, La., to the mouth, is about 170 miles. Before improvement it was navigable to Point Jefferson, La., 151 miles, but passage was difficult and dangerous on account of overhanging trees and snags and logs in the channel.

The project adopted in the river and harbor act of March 3, 1881, contemplated removing obstructions to afford safe navigation at high stages between the mouth and Wallace Landing.

Under river and harbor act of August 5, 1886, a supplemental project was entered upon for the closure of three outlets near Point Jefferson, to confine the flow to the main channel, based on report of examination printed in Report of the Chief of Engineers for 1885, page 1545 (H. Doc. No. 99, 48th Cong., 2d sess., no maps).

Reference to examination reports (without maps), not in project documents, and contained in the following Reports of the Chief of Engineers: Outlets near Point Jefferson, 1891, page 1986; 1893, page 2016; 1896, page 1608 (with cross sections); and 1907, page 1502. Above Wallace Landing, La., 1895, page 1969 (H. Doc. No. 350, 53d Cong., 3d sess.).

The existing project is for maintenance from the mouth to Wallace Landing, La., at an annual cost of about $5,000.

The total expenditure to June 30, 1912, was $76,366.67. The original project was completed in 1896 at a cost of $40,992.84. Since then $29,932.05 (including $27.75 received from sales) has been expended for maintenance. In 1887–88, by uniting with planters whose lands would be protected from overflow, the outlets near Point Jefferson were closed by earthen dams, the proportion of the cost borne by the United States having been $5,441.78.

The work put the stream in safe navigable conditions at stages high enough to permit steamboats to cross the bars and, when completed, enabled them to save 36 hours' time on a trip.

The closure of the outlets gave immediate benefit to navigation by concentrating the flow to the main stream, lengthening the period of navigation, and causing the bars to scour. The dams, however, were destroyed in 1890, during an overflow from Mississippi River, caused by crevasses in the levees near the headwaters of Boeuf River, and funds for their restoration have not been provided.

Navigation is rendered more difficult on account of the outlets at Point Jefferson, and additional interest in the project for again closing them is maintained through the necessity of draining Bayou Lafourche Basin, into which the outlets flow, to permit development of a rich tract of land containing 220,800 acres, much of which has been converted into a swamp and all of which is seriously affected by flood water from Boeuf River.

The commerce consists of shipments of cotton, cotton seed, staves, etc., and return freights of general merchandise and plantation supplies, and for 22 years ranges between a maximum of 11,261 short tons in 1897, and a minimum of 545 short tons in 1903, the average being 5,522 short tons, valued at $223,400.

The available funds and the appropriation recommended will be applied to maintenance by the removal of obstructions, including snags, overhanging trees, drift, etc.

(*c*) *Tensas River and Bayou Maçon, La.*—Tensas River has its source in Lake Providence, in northeastern Louisiana, within 2 miles of the Mississippi River, flows in a general southerly direction, gradually diverging from the Mississippi, and joins with the Ouachita and Little Rivers at Trinity, La., 294 miles below Camden, Ark., in forming Black River. It is about 235 miles long. The section included in the project extends from the mouth upstream to Dallas, La., 138 miles.

Bayou Maçon has its source in Desha County, Ark., near the source of Boeuf River, and a few miles west of the Mississippi River, flows in a general southerly direction west of and nearly parallel to Tensas River and enters that stream 42.7 miles above its mouth. Bayou Maçon is about 270 miles long. The section included in the project extends from the mouth upstream to Floyd, La., 112 miles.

Before improvement these streams were navigable at high stages, but the passage of steamboats was difficult and dangerous on account of leaning trees and numerous snags, logs, stumps, etc., in the channel.

The project adopted in the river and harbor act of March 3, 1881, contemplated removing obstructions in Tensas Basin from its mouth to Dallas, La.

The existing project is for maintenance of the improvement of Tensas River from its mouth to Westwood Place, 81 miles, and Bayou Macon, below Floyd, at an annual cost of about $6,000.

Work for maintenance of the improvement was not resumed during the fiscal year ending June 30, 1912. The expenditure of $8.35 was for traveling expenses incident to inspection of the work.

The total expenditure to June 30, 1912, was $68,604.59. The project for Tensas River was completed in 1898 to Westwood Place, 81 miles above the mouth, the present head of navigation, at a cost of $11,947.02, and the project for Bayou Macon to Floyd was completed in 1899, at a cost of $23,915.42. The sum of $32,742.25, including $27.75 derived from sales, has been expended for maintenance. Lane Ferry, about 20 miles above Floyd, is the head of navigation in Bayou Macon. The work put the two streams in fairly good navigable condition at medium and high stages. Upper Tensas River above Westwood Place practically is unnavigable by reason of leaning timber and obstructions in the channel, and there has been no recent effort to induce a resettlement of the abandoned plantations along its banks or to secure a continuance of the improvement to Dallas.

The commerce consists chiefly of shipments of cotton, cotton seed, staves, etc., and return freights of plantation supplies. In 22 years it has ranged between a maximum of 29,957 short tons in 1905 and a minimum of 2,649 short tons in 1893, the average being 13,907 short tons, valued at $567,200.

It is proposed to apply the available funds and the appropriation recommended to the removal of snags, overhanging trees, drift, etc., for maintenance.

(*d*) *Bayous D'Arbonne and Corney, La.*—Bayou D'Arbonne is formed by the junction of the south, middle, and north, or Corney, branches near Farmerville, Union Parish, northern Louisiana, flows in a southeasterly direction and enters Ouachita River 6 miles above Monroe, La., and 161.7 miles below Camden, Ark. Its length is 37.7 miles.

Bayou Corney is a small creek, has its source in Claiborne Parish, La., and flows in a southeasterly direction. Cobb Landing, La., the head of navigation, is 19.3 miles above its mouth. Stein Bluff is 2.8 miles above its mouth. The creek is about 76 miles in length.

Little D'Arbonne, the south branch, also is a small creek, has its source near Homer, Claiborne Parish, La., and flows in an easterly direction. It is about 56 miles long.

The project entered upon in the river and harbor act of July 5, 1884, contemplated removing obstructions between the mouth of Bayou D'Arbonne and Stein Bluff on Bayou Corney, 40.5 miles upstream. The river and harbor act of July 13, 1892, authorized an extension of the work 16.5 miles up the Corney branch to Cobb Landing. The river and harbor act of August 17, 1894, directed that $1,000 should be expended in removing obstructions from the Little D'Arbonne.

The existing project is for maintenance of the improvement below Cobb Landing, at an estimated annual cost of about $2,000.

During the fiscal year ending June 30, 1912, the limited balance of the allotment for the streams was expended for the removal of obstructions in Bayou D'Arbonne between its mouth and Bayou Choudrant, 7.6 miles upstream.

The amount expended to June 30, 1912, was $29,600 and resulted in greater safety to navigation. The work practically was completed in 1896, at a cost of $18,000. Subsequent expenditures for maintenance have amounted to $10,600, and $1,000 was expended for improving Little D'Arbonne Branch.

The commerce consists of shipments of cotton, cotton seed, etc., and return freights of plantation supplies. It varies considerably, and during 16 years ranged between a maximum of 104,691 short tons in 1911 and a minimum of 682 short tons in 1903, the average being 16,160 tons, valued at $291,300.

The appropriation recommended will be applied to removal of obstructions, including snags, overhanging trees, drift, etc., for maintenance and extension of benefits.

Consolidated.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$16,000

BOGUE FALIA, AMITE, CHEFUNCTE, AND TICKFAW RIVERS, LA.

These streams prior to 1902 had been improved under separate appropriations, but were combined by the act of June 13, 1902.

(*a*) *Chefuncte River and Bogue Falia.*—The Chefuncte River and its tributary, Bogue Falia, form an important waterway in southeastern Louisiana, the Chefuncte emptying into Lake Pontchartrain on its north shore almost directly opposite the city of New Orleans, La.

The Chefuncte, from the Bogue Falia to its mouth, about 10 miles, has a width of from 250 to 800 feet and a depth of from 15 to 30 feet. It was obstructed by a bar at its mouth over which a depth of only 5½ feet existed at ordinary low water, or 4½ feet at the lowest water, and also by snags, logs, fallen and overhanging trees. For 3 miles above the junction with the Bogue Falia navigation was practicable only for the smallest schooners and timber rafts, the remainder of the stream, because of its tortuous channel and rapid current, not being navigable. Improvement above the junction has consisted only in the removal of snags, sunken logs, etc., in the first 3 miles.

Bogue Falia is navigable and has been improved as far as Covington, La., about 4 miles above its junction with the Chefuncte, and to this point has widths of 60 to 250 feet and had depths of from 4 to 20 feet. It was obstructed by snags, logs, fallen and overhanging trees, shoals, and several wrecks, and prior to improvement could be navigated to Covington only by the smallest schooners.

Tide water extends to Covington on the Bogue Falia. Considerable commerce existed on these streams prior to improvement, and for the year ending July 1, 1871, 710 vessels were reported as arriving in New Orleans from the Chefuncte.

The act of 1872 appropriated $6,000 for the removal of the wreck of the gunboat *Oregon* from the Chefuncte; the work was performed in 1872 and 1873 at a cost of $5,221.

The existing project, adopted March 3, 1881, is based on a report made in 1880 (Report of the Chief of Engineers for 1880, p. 1181), which contemplated dredging through the bar at the mouth of the Chefuncte and the removal of snags, overhanging trees, etc., to Covington on the Bogue Falia, at an estimated cost of $5,460.

The project for improvement, as modified to date, provides for a channel from the mouth of the Chefuncte River to Covington, on the Bogue Falia, with a minimum depth of 7 feet, by dredging, where necessary, and by the removal of snags, overhanging trees, and other obstructions.

The channel through the bar at the mouth of the Chefuncte River was improved by the construction of a pile breakwater in 1885, and by dredging in 1899, 1902, and 1910. Dredging through the shoals in the Bogue Falia was done in 1887, 1895, and 1910. Snags, trees, etc., were removed in 1882, 1891, 1900, and 1910. For the maintenance of this and other improvements, a combined dredge and snag boat was constructed in 1908 and 1909.

There were no field operations during the fiscal year. Expenditures were for collection of commercial statistics and for a pro rata share of repairs to the dredge *Delatour*, and amounted to $56.15.

Of the amount appropriated by act of June 25, 1910, and allotted to "Improving Tickfaw River and tributaries, La.," $1,000 was withdrawn from that allotment and reallotted to this work.

To June 30, 1912, there has been expended on the works of the existing project the sum of $31,929.47, of which $12,587.23 was for maintenance.

The existing project is considered completed, present work being for maintenance.

Before improvement the maximum depth that could be carried to Covington at low water was about 4 feet, and the channel was badly obstructed. At present, a channel, practically free from obstructions, exists from Lake Pontchartrain to Covington, with a depth of 7 feet.

(b) *Tickfaw River and tributaries, La.*—The Tickfaw River and tributaries form a small system of streams in southeastern Louisiana; the Tickfaw flows into Lake Maurepas and is joined by one tributary, the Natalbany, 2 miles above its mouth; by another, the Blood, 8 miles above its mouth. The Ponchatoula is a tributary of the Natalbany, joining it 4 miles above its junction with the Tickfaw.

Prior to improvement, the head of navigation on the Tickfaw was at a point 16 miles above its mouth, the stream to that point having a depth of 9 feet and over at low water and widths of 100 to 500 feet. A bar tends to form at the mouth of the Tickfaw, over which at the lowest water depth of 7 feet existed. Above the sixteenth mile from its mouth the Tickfaw shoaled rapidly, and was exceedingly obstructed with snags, logs, fallen and overhanging trees.

The Natalbany was navigable to Springfield, La., 10 miles above its junction with the Tickfaw, and had a depth of 10 feet to this point, and widths of 100 to 300 feet. The Blood was navigable for 4 miles above its junction with the Tickfaw, having a depth of 10 feet to this point and widths of 80 to 200 feet.

The Ponchatoula was navigable for 4½ miles above its junction with the Natalbany, having a depth of 10 feet and over and widths of 80 feet to 150 feet. All of these streams were obstructed prior to improvement with snags, logs, fallen and overhanging trees from their mouths to the head of navigation, but considerable commerce existed, and at the time of the first examination and survey in 1879 there were 3 to 4 schooners per week engaged in navigating each of these waterways, besides the rafting of considerable timber.

The project under which work of improvement has been carried on is based on a report submitted in 1880, was adopted in 1881, and contemplates the removal of obstructions on the Tickfaw for 26 miles above its mouth; on the Blood River to the head of navigation, 4 miles; and on the Natalbany and Ponchatoula Rivers, 15½ miles, at an estimated cost of $10,230.

The existing project has not been modified since its adoption.

The Tickfaw River was cleared of obstructions in 1882 and 1884; the Blood, Ponchatoula, and Natalbany in 1886 and 1887, the project being then reported completed.

Work of maintenance has been carried on by the removal of obstructions every two or three years.

For maintenance of this and other improvements, a combined dredge and snag boat was constructed in 1908 and 1909.

The work of removing obstructions from the Ponchatoula River as far as Wadesboro, was completed at the beginning of the fiscal year.

The sum of $1,844.20 was expended during the year, and $1,000 of the amount appropriated by act of June 25, 1910, and allotted to this stream, was withdrawn and allotted to Chefuncte River and Bogue Falia.

To June 30, 1912, there has been expended on the works of existing project the sum of $22,157.46, of which $14,041.97 was for maintenance.

The work of improvement on these streams has resulted in the removal of obstructions from portions of the stream that were navigable prior to improvement, and has rendered portions navigable that could not be navigated previously.

The maximum draft that can be carried over the bar at the mouth of the Tickfaw is 6½ feet at mean low water. The usual variations of the water surface are about 9 feet in the upper portions of these streams and 2 to 3 feet at the mouth of the Tickfaw.

The head of navigation on the Tickfaw is at present at a point 16 miles above its mouth, the stream being navigable, in fact, for 5 miles farther. On the Natalbany the head of navigation is at the parish bridge, 12 miles above its mouth; on the Blood, 4 miles above its mouth; and on the Ponchatoula, 5 miles above its mouth.

Comparative statement of receipts and shipments for 10 years.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1901	56,464	924	
1902	45,632		10,832
1904	86,302	40,670	
1905	45,429		40,873
1906	34,690		10,739
1907	44,350	9,660	
1908	41,101		3,249
1909	47,571	6,470	
1910	114,108	66,537	
1911	117,449	3,341	

As there are no railroads in the section adjacent to the navigable portions of these streams there is no effect on freight rates due to the improvement.

The funds estimated for the fiscal year 1914 will be applied to the maintenance of the work in accordance with the approved project, which is necessary to make the improvement available.

(*c*) *Amite River and Bayou Manchac, La.*—The Amite River and its tributary, Bayou Manchac, lie in southeastern Louisiana, the Amite flowing into Lake Maurepas on its western shore. Bayou Manchac joins the Amite River from the west about 37 miles above its mouth. The Amite from Lake Maurepas to Bayou Manchac is a tide-water stream and has widths of 200 to 300 feet and depths of 10 to 30 feet except at its mouth, where a bar exists on which a depth of 5 to 6 feet existed at low water. This section prior to improvement was somewhat obstructed with snags, logs, fallen and overhanging trees. For a distance of about 73 miles above Bayou Manchac the Amite had widths of 100 to 200 feet and depths at low water of 2 to 15 feet, being badly obstructed with snags, logs, fallen and overhanging trees, and sand bars.

Bayou Manchac from its mouth to Hope Villa, about 9 miles, has a width of 100 to 200 feet and depths of 8 to 15 feet except at its mouth in the Amite, where a bar exists over which there was originally a depth of 4 to 5 feet at low water. This section was slightly obstructed with logs, snags, fallen and overhanging trees. The bayou can be considered navigable above Hope Villa for 4 miles only, as the upper bayou goes dry in low water and is exceedingly obstructed with snags, logs, trees, etc.

Prior to improvement some navigation existed on the lower Amite and Bayou Manchac and a small steamer made regular trips to Hope Villa on the Manchac.

The existing project, as modified to date, provides for the removal of obstructions from the Amite River from its mouth to 5 miles above the mouth of Bayou Manchac, and from Bayou Manchac from its mouth to Wards Creek, and for dredging channels 8 feet deep through the bars at the mouth of Amite River and Bayou Manchac.

To June 30, 1912, there has been expended on the existing project the sum of $58,827.03, of which $33,926.21 was for maintenance.

The project is considered completed, present work being for maintenance. The improvements have resulted in the removal of obstructions to navigation and in increasing the depth over bars. The lengths of the navigable portions of both streams have also been increased.

The maximum draft that can be carried is 6½ feet—over the bar at the mouth of Amite River. The variations of the water surface in Lake Maurepas are about 2 feet, due to winds; in the Manchac and upper Amite, 6 to 12 feet, due to freshets.

The head of navigation on the Amite River is considered to be about 5 miles above the mouth of Bayou Manchac; on Bayou Manchac, at the turning basin, just above Hope Villa.

Comparative statement of receipts and shipments for 10 years.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1901	69,918	44,518	
1902	44,694		25,224
1904	120,851	76,157	
1905	43,371		77,480
1906	50,669	7,298	
1907	45,552		5,117
1908	43,558		1,994
1909	56,745	13,187	
1910	76,616	19,871	
1911	40,788		35,828

There are no definite data as to the effect of the improvement on freight rates, as the territory adjacent to the navigable portions of these streams is practically without railroads.

The funds estimated for the fiscal year 1914 will be applied to the maintenance of the work in accordance with the project, which is necessary to make the improvement available.

Consolidated.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$7,000

JOHNSONS BAYOU, LA.

This stream is in the extreme southwestern portion of Louisiana, runs northwesterly to Sabine Lake, La., and is approximately 25 miles long. It is under improvement at the mouth only.

A preliminary survey, made in 1897, showed a minimum depth of channel of 12 feet and only 2½ feet over the bar at the mouth of the bayou at mean low water.

The project of April, 1899, printed in House Document No. 299, Fifty-fourth Congress, second session, provided for dredging a 6-foot channel through the bar at the mouth of the bayou of such width as the appropriation ($2,500) would permit.

This work was completed during December, 1899, and a channel 6 feet deep and 60 feet wide secured. No work having been carried on from that date to 1904 and none being considered necessary at that time, the unexpended balance of the appropriation, $238.65, was carried to the surplus fund in the Treasury on June 30, 1904. The total amount expended on the original project was $2,261.35.

The river and harbor act of March 2, 1907, appropriated $2,500 for this improvement, and an examination of the bar at the mouth of the bayou was made, but the district officer reported this stream to be unworthy of further expenditure for either improvement or maintenance by the United States.

The amount expended on this examination was $46, leaving an unexpended balance of $2,454. In November, 1908, an additional examination was ordered and made at a cost of $86.50, which resulted in a recommendation by the district officer that the available balance, $2,367.50, be expended in dredging a channel across the bar, using the U. S. dredge *Port Arthur*.

This recommendation was approved, and in the month of May, 1910, a channel was dredged at the mouth of Johnsons Bayou 2,100 feet long, 90 feet wide, with an average depth of 6½ feet at mean low Gulf level, at a cost of $1,738.39.

This dredged channel, being out in Sabine Lake and unprotected by revetments, rapidly deteriorated. A survey of the dredged channel, made in February, 1911, showed that it had almost completely filled up, and redredging was necessary.

Additional funds being allotted in March, 1911, the U. S. dredge *Port Arthur* was moved to Johnsons Bayou Bar, and on March 27 began redredging channel across bar into Sabine Lake. This dredging was completed May 5, 1911, resulting in securing a channel 2,200 feet long, 110 feet wide, and an average of 7 feet deep at mean low Gulf level.

During the year $0.22 was expended in the payment of an outstanding liability from the previous fiscal year, making the total expenditures to June 30, 1912, $6,557.04.

Comparative statement of shipments and receipts.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1908	5,314		
1909	4,188		1,126
1910	3,167		1,021
1911	2,331		836

On June 30, 1911, there existed 6½ feet of water through the new channel (110 feet wide) at mean low Gulf level. The usual variation in tide is 1 foot. Johnsons Bayou is navigable for 5 miles, to the settlement of Johnsons Bayou, La. This navigation is carried on by means of barges and gasoline launches.

Report on examination of this stream will be found on page 1790, Annual Report of the Chief of Engineers for 1897, which report does not contain maps.

Since June 30, 1911, the channel across the bar at the mouth has silted and now has a depth of 4.5 feet and a width of 60 feet. It is believed that the channel secured in the fiscal year 1911 should be kept open, and that commerce will increase as continued depth is maintained. The amount estimated for maintenance of improvement during the fiscal year 1914 is for maintaining depth by dredging.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$2,500

BAYOU LAFOURCHE, LA.

Bayou Lafourche prior to 1902 was an outlet of the Mississippi River, its head being at Donaldsonville, 80 miles above New Orleans. Under authority of the act of June 13, 1902, authority to close it at its head was granted, under certain conditions, to the joint organization of the Atchafalaya and Lafourche levee boards of the State of Louisiana, by extending the river levee across it. From the Mississippi to its mouth in the Gulf of Mexico it has a length of 107 miles, with widths varying from 75 to 150 feet. According to a report submitted in 1874 it was obstructed prior to improvement with stumps, snags, wrecks, and sand bars, depths over the latter being as little as 2½ feet at low water, though otherwise the bayou had depths of from 4 to 10 feet at low water.

The existing project, adopted August 11, 1888, is based on a report submitted in 1886 (Report of the Chief of Engineers for 1886, p. 1266) and contemplates a lock at the head of the bayou and a channel 75 feet wide and 5 feet deep at extreme low water in the bayou below the proposed lock, by dredging, at an estimated cost of $450,000. That part of this project which contemplates securing a navigable channel, by dredging, at an estimated cost of $240,000 was adopted by Congress in 1888. Project was modified in 1896 so as to hold the matter of construction of the lock in abeyance and restrict operations to maintenance of low-water navigation in the upper part of the bayou, by dredging, at an estimated cost of $25,000 per annum. Under authority of the act of June 13, 1902, the levee boards named above were authorized to close the head of Bayou Lafourche with a dam for a period of two years and six months, pending construction of a lock at the head of the bayou by the levee boards.

Act of April 13, 1904, extended this time three years, and the act of March 2, 1907, extended the time to January 1, 1910. Plans were drawn for the lock and duly approved by the Secretary of War, but it was found that the lock would cost a larger sum than was obtainable, and there the matter was allowed to rest until the fall of 1909. Plans are now being drawn for another lock, which, it is believed, can be built for an amount within the resources of the board, and it is expected that they will shortly be submitted for approval.

The project as modified to date provides for the maintenance of a channel at least 75 feet wide and 5 feet deep throughout the bayou at extreme low water. A lock connecting the bayou with the Mississippi River at Donaldsonville is to be constructed by the joint organization of the Atchafalaya and Fafourche levee boards.

Under the existing project work began in 1888 and was continued annually during the low-water seasons till 1902, the work consisting principally in the dredging of shoals in the upper 10 miles of the stream, though operations of dredging and removal of obstructions were on several occasions carried farther downstream, extending from 38 to 100 miles below the head of the bayou.

A survey of the entire bayou, from its head to mouth, was made, work beginning in January and completed about May 1, at a cost of $4,746.21. The survey was made for the purpose of locating drainage ditches and placing the responsibility for obstructions.

The sum of $5,435.48 was expended during the fiscal year.

To June 30, 1912, there had been expended on the existing project the sum of $233,666.06, of which $13,150.97 was for maintenance. The sum of $1,914.83 reverted to the Treasury on June 30, 1909.

The stream is navigable and navigated to within a short distance of the dam at its head, and the maximum draft which can be carried over the shoalest part of the upper bayou is 4 feet at low water.

The usual variations of the water surface under present conditions is that due to tide being from 1 to 2 feet in the lower bayou and a few inches in the upper part.

Comparative statement of receipts and shipments for 10 years.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1902	132,745		4,612
1903	94,351		38,394
1904	66,839		27,512
1905	94,320	27,481	
1906	59,092		35,228
1907	46,433		12,679
1908	64,914	18,501	
1909	70,618	5,704	
1910	80,935	10,317	
1911	115,749	34,814	

The effect of the work of improvement on freight rates is not definitely known.

Commerce on the bayou has an outlet to the Mississippi through two toll canals, viz, the Harvey Canal and the Company Canal.

The funds estimated for expenditure during the fiscal year 1914 will be applied to maintenance of work in accordance with the approved project, necessary to keep the improvement available.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$2,000

BAYOU QUEUE DE TORTUE, LA.

Bayou Queue de Tortue is a tributary of the Mermentau River and flows into that stream about 5 miles above the head of Lake Arthur. It rises in the western part of the Parish of Lafayette and flows in a southwesterly and westerly direction between the Parishes of Acadia and Vermilion.

The stream has been surveyed from its mouth to a point 23.9 miles above, the distance being measured along the bayou. The survey was stopped there, as the stream above that point was found to consist of short open stretches of water and straight sections of swamp thickly covered by timber, and any improvement of this portion would involve an outlay entirely out of proportion to the benefits to be derived.

The project adopted by the river and harbor act approved July 25, 1912, is to clear the stream of obstructions from its mouth to the Southern Pacific Railway Bridge, about 19.5 miles above its mouth, by removing snags, logs, fallen and overhanging trees, and also to make a number of cut-offs across such points as are so short as to interfere with safe navigation, at an estimated cost of $25,000, and $1,000 per annum for maintenance, all in accordance with report submitted in House Document 609, Sixty-first Congress, second session, and subject to the conditions set forth in said document, i. e., that the necessary right of way for the cut-offs is furnished free of cost to the United States.

It is expected that the work will be completed during the fiscal year 1913 and that the funds estimated to be expended during the fiscal year 1914 will be for the maintenance of the improvement.

Amount appropriated by river and harbor act approved July 25, 1912	$25,000
Amount available for fiscal year ending June 30, 1912	25,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 1,000

SOUTHWEST PASS, MISSISSIPPI RIVER.

Southwest Pass is one of the principal outlets of the Mississippi River. It flows in a generally southwest direction and its length from the Head of the Passes to the Gulf of Mexico is about 15 miles. It was obstructed by a bar at its mouth, having a depth of only 9 feet over it, while the remainder of the pass had depths ranging from 26 to 83 feet at low water (mean low Gulf level). The width of the pass varies between 1,200 and 2,400 feet.

Prior to the opening of South Pass to deep-draft vessels Southwest Pass was the entrance to the river generally used by vessels bound to and from the port of New Orleans.

A history of the attempted improvements of the mouth of the Mississippi River from 1837 to 1898 is given in the Annual Report of the Chief of Engineers for 1899, page 1914.

The existing project for improvement is based on reports submitted in 1899 and 1900 (Reports of the Chief of Engineers for 1899, p. 1863, and for 1900, p. 2287), was adopted by the act of June 13. 1902, and contemplates securing a channel 35 feet deep at mean low water and 1,000 feet wide throughout Southwest Pass by dredging; the construction of two jetties to maintain the channel; the construction of sills across Cubits Gap, the Jump, and Baptiste Collets Canal; the closing of all minor outlets below the forts; the construction of a dredge in addition to the one provided for by the acts of March 3, 1899, and of June 6, 1900, under appropriation for improving outlets of the Mississippi River; the necessary plant, such as tugboats, barges, tracks, buildings, etc.; and the purchase of land at the shore ends of the jetties, at an estimated cost of $6,000,000 and $150,000 per annum for maintenance. The act of 1902 adopting the project authorized the Secretary of War, in his discretion, to modify the plans described in the report submitted in 1900. The act of May 28, 1908, included in the improvement the dredging of shoals in the river between Cubits Gap and the Head of the Passes, where necessary to secure a depth of 35 feet with practical width. Additional dredging plant was authorized by the act of March 3, 1909.

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[1] Exclusive of amount available for fiscal year 1913.

Under the existing project all of the land below or south of Pilottown on the east bank and all that below the United States reservation on the west bank of Southwest Pass, containing about 1,275 acres, was acquired on July 10, 1903, for use in connection with the work, at a cost of $5,000.

Construction of the jetties was commenced in December, 1903, and completed in January, 1908, at a cost of about $2,627,000. Extension of the east jetty for a length of 3,000 feet and of the west jetty for a length of 3,750 feet was commenced in April, 1911, and work is still in progress. These extensions are part of the original project of improvement.

Under authority for construction of dredges, the *Barnard* was constructed in 1904, at a cost of $240,000; the *Benyaurd* in 1904, at a cost of about $415,000; and the *New Orleans* in 1912, at a cost of about $520,000. By act of February 27, 1911, the *Barnard* was transferred to the Mobile (Ala.) engineer district, and by act of July 25, 1912, retransferred to the Southwest Pass improvement.

Dredging operations began in April, 1905, and until June 30, 1912, about 11,633,000 cubic yards of material had been removed by Government dredges; the *St. Johns*, *Sumter*, and *Atlantic*, borrowed from other engineer districts, being also used at various times. In 1907 and 1908 some 3,575,000 cubic yards of material was removed under contract.

Sills were placed across Cubits Gap and the Jump and additional mattresses placed on the sill at the head of Pass à Loutre in 1907 and 1908. Ten outlet bayous from Southwest Pass were closed with sheet-pile dams, the Eads mattress at the Head of the Pass was removed, and 10 spur dikes along the jetties were constructed between 1908 and 1911.

In 1908 and 1909 coaling plant, wharf, and foundations for buildings and walks, steel-frame building, ice machine, refrigerating and distilling plant, office building, and 16 dwellings were constructed, boiler installed in machine shop, and machines, tools, etc., purchased, at a total cost of $116,388.40.

Operations during the fiscal year consisted in dredging by the U. S. dredges *Benyard*, *Atlantic*, and *New Orleans*, the latter, however, operating but 47 days. The amount of material removed was 3,314,770 cubic yards.

Under contract, approved April 13, 1911, Messrs. Christie & Lowe, contractors, placed 183,555 $\frac{5}{9}$ square yards of mattress and 69,016 tons of stone in building the extension to the jetties.

The outlet known as Double Bayou, 8.2 miles below the Head of the Passes lighthouse, was closed by a sheet-piling dam 189 feet long.

Two spur dikes were extended 130 feet and 150 feet, respectively, and maintenance work done in connection with others and the jetties.

Many minor but important items of repair were made by the shore plant, necessary surveys made, and work pertaining to general care and preservation of plant and premises done.

The available depth is 31 feet at mean low tide.

The channel was opened to navigation December 26, 1911.

The sum of $744,337.90 was expended during the fiscal year.

To June 30, 1912, there has been expended on the existing project the sum of $6,364,614.78.

There has been received from miscellaneous sources, such as sales, etc., the sum of $4,966.72.

The amount required for expenditure during the fiscal year ending June 30, 1914, is intended for continuing improvement and for maintenance.

As stated in the Annual Report of the Chief of Engineers for 1911, "The work is proving somewhat more expensive than was originally contemplated by the board whose estimates were accepted, but any estimate dealing with a work of such character and magnitude must necessarily be more or less uncertain." For this reason the original estimate was more or less uncertain, and any estimate now made ought not to be regarded as absolutely definite.

Amount (estimated) required to be appropriated for completion of existing project	$500,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	500,000

BAYOU TECHE, LA.

Bayou Teche, an important commercial stream of southern Louisiana, has its source in Bayou Courtableau in St. Landry Parish, and flows in a southeasterly direction a distance of 124 miles to where it joins the lower Atchafalaya River, about 12 miles above Morgan City, La. It is an outlet of Bayou Courtableau during periods of high water and was formerly, at times, navigable to its head, but at present owing to lack of depth there is little navigation above St. Martinville, 75 miles above its mouth. The bed of the upper Teche just below the Courtableau is now 5½ feet above low water in that stream. The current during low-water season is very sluggish, as the Teche has no tributaries and the only water it then receives is that from rainfall on the very narrow watershed, generally less than 1 mile wide, adjacent to the stream. The bayou has a width varying from about 70 feet at St. Martinville to 350 feet near its mouth, and is reported in its original condition to have possessed a depth of 8 feet as far as St. Martinville at low water. At the time of the first survey by the United States in 1870 it was found to be much obstructed with logs, snags, fallen and overhanging trees, and wrecks.

The original project, adopted July 11, 1870, provided for the removal of obstructions from the head to the mouth of the stream, and under this project they were removed in 1871 and 1872 from the mouth to St. Martinville. In 1880 and 1881 obstructions were removed under contract from St. Martinville up to Leonville, a further distance of 37 miles, and in 1885 and 1886 obstructions were removed from New Iberia to the head of the bayou by a United States snag boat and hired labor. These improvements were not permanent, as other obstructions formed.

The total expenditures under the project of 1870 were $45,004.43; the sum of $5,022.48 reverted to the Treasury from the appropriation of 1870, including the sum of $448.75 derived from sale of property.

The existing project is the project of 1891, as modified by act of March 2, 1907, and provides for a 6-foot navigation to Arnaudville, 106 miles above the mouth of the bayou, by dredging, removal of snags, and the construction of a lock, in accordance with the report submitted in House Document No. 527, Fifty-ninth Congress, first session, at an originally estimated cost of $111,000, which, on account of unusual conditions, was increased in 1911 to $195,000.

The expenditure for a 6-foot navigation to Arnaudville was contingent on all lands necessary for lock and dam purposes, and canal feeders being deeded to the United States free of cost, and upon the United States being secured against possible claims for damages resulting from the overflow of lands by reason of the lock and dam improvement or from the draining of Spanish Lake. This last requirement was effected by the submission of personal bonds to an amount of $10,000 covering a period of 10 years, which were approved by the department, as it was impossible to secure bonds in perpetuity. Land for the lock and dam site, consisting of 12.27 acres, was deeded to the United States, and the deeds, approved by the Attorney General April 23, 1909, were recorded May 1, 1909, in book No. 70, pages 559–563, at St. Martinville, parish of St. Martin, La.

Maintenance by open-channel work.—In 1908 a channel was dredged through the bars below New Iberia, and in 1911 dredging was done through shoals below Jeanerette. There was no work of maintenance during the past fiscal year.

There has been expended during the fiscal year the sum of $113,939.51 for works of improvement.

To June 30, 1912, there has been expended on the existing project the sum of $215,803.17, of which $15,793.04 was for maintenance, $4,293.53 for resurvey of the bayou in 1905, and $195,716.60 for works of improvement.

It is estimated that on June 30, 1912, the project was 60 per cent completed.

The head of navigation is considered to be at St. Martinville, 75 miles from the mouth, though the stream is navigable in fact 15 miles farther up. The depth at mean low water varies from 8 feet at the mouth to 4 feet at St. Martinville. The oscillation of the water surface due to flood water is about 12 feet in the upper and 3 to 4 feet in the lower part. There is also a small oscillation at low water in the lower part of the stream, due to tides.

There is no evidence as yet of any effect on freight rates, but since the opening of the Plaquemine Lock a boat line has been established between Teche points and New Orleans, with rates considerably lower than corresponding railroad rates.

It is believed that the $25,000 estimated for expenditure for works of improvement during the fiscal year 1914 will be sufficient to complete the work in accordance with the approved project, and is necessary to make the improvement available. The $15,000 estimated for maintenance of the improvement will be spent in dredging and removing snags and other obstructions in this stream.

Amount (estimated) required to be appropriated for completion of existing project	$25,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for manitenance	40,000

BAYOU VERMILION AND MERMENTAU RIVER AND TRIBUTARIES, LA.

These streams prior to 1902 had been improved under separate appropriations, but were combined by the act of June 13, 1902.

(*a*) *Channel, bay, and passes of Bayou Vermilion.*—Bayou Vermilion is the first stream in southern Louisiana west of and not connected with the Atchafalaya River. It flows into the western end of Vermilion Bay through two outlets known as the Passes. It is considered navigable to Lafayette, 52 miles above its mouth, where it is crossed by the fixed bridge of the Morgan's Louisiana & Texas Railroad & Steamship Co., and has widths below this point varying from 50 to 400 feet and depths of from 4 to 20 feet at low water.

Prior to improvement it was navigable at its higher stages to a point 49 miles above its mouth, but was obstructed, principally in the upper reaches, with snags, logs, fallen and overhanging trees, and shoals over which a depth of only 2 feet at low water existed.

It was also obstructed by a bar at its mouth over which there was a depth at low tide of only 2 feet. Considerable navigation existed on the bayou by steamers and flatboats prior to the construction of the railroads to Lafayette and Abbeville.

The project under which work of improvement has been performed was adopted in 1880, and is based on reports of that year (Report of the Chief Engineers for 1880, pp. 1156 and 1164), recommending the removal of obstructing timber so as to afford a depth of 5 feet at low water as far as the railroad bridge, and also the closure of one of the passes at an estimated total cost of $9,900. This project was modified in 1892 so as to provide a depth of 5½ feet to the railroad bridge and the marking of the channel in Vermilion Bay with guide piles at an estimated cost of $25,000 additional. The work was not considered permanent, as other obstructions formed from time to time.

To June 30, 1912, there had been expended on the existing project the sum of $57,312.89, of which $22,412.89 was for maintenance.

The project is considered completed, present work being for maintenance. Work of improvement has resulted in increasing the maximum draft and the ease of navigation.

The maximum draft that can be carried at low water (mean low Gulf level) over the bar at the mouth of Bayou Vermilion is about 2 feet, and a depth of 4 feet can be carried to Lafayette at ordinary stages of water. The usual variation of the water surface at the mouth is 1 to 2 feet, due to tide, and at the railroad about 12 feet, due to flood water.

No data is at present available showing the effect of the improvement on freight rates, but it is understood that the town of Abbeville, La., enjoys reduced railroad freight rates owing to its location on this waterway.

The funds estimated for expenditure during the fiscal year 1914 will be applied to the maintenance of the work in accordance with the project, which is necessary to make the improvement available.

(*b*) *Mermentau River and tributaries, La.*—The Mermentau River lies in southern Louisiana and is formed by the junction of Bayou Nezpique and Bayou des Cannes, 2 miles above the town of Mermentau, at the crossing of the Southern Pacific Railroad. It flows in a southwesterly direction for 70 miles and empties into the Gulf of Mexico, after passing through Lake Arthur, Grand Lake, Upper Mud Lake, and Lower Mud Lake. It differs from the streams between it and the Mississippi River by having several tributaries, both Bayou Queue de Tortue joining it from the east 5 miles above the head of Lake Arthur and Bayou Lacassine flowing into Grand Lake from the west, being navigable. Bayou Plaquemine Brule is a tributary of Bayou des Cannes, joining it from the east 3 miles above its mouth.

The Mermentau proper has widths of from 250 to 1,000 feet and low-water depths of 10 feet and over. Through Lake Arthur, which is 6 miles long and averages about 1 mile in width, there is a low-water depth of 7 to 8 feet. Through Grand Lake the channel is about 11 miles long, with an average depth of 6 feet except where the river enters the lake, where a bar exists over which there was originally a depth of only 5 feet, and where the river leaves the lake there is a bar over which a depth of 4½ feet existed at low water. Through Lower Mud Lake there was an available depth at low water of 4 feet, and 4½ feet existed over the bar at the mouth of the river in the Gulf of Mexico. The tributaries of the Mermentau are as a rule exceedingly crooked, with widths from 50 to 200 feet and depths of 6 feet and over at low water, and are much obstructed with snags, logs, fallen and overhanging trees. Navigation on these tributaries extended for 10 to 25 miles above their mouths, and prior to improvement considerable commerce existed on them and the main stream.

The project under which work of improvement has been carried on was adopted in 1892, based on a report submitted the previous year (Report Chief of Engineers, 1892, p. 1862), and contemplates the removal of snags, etc., from the Mermentau and for about 25 miles on Bayou Nezpique and the construction of brush dams in Lower Mud Lake, so as to deepen the channel by scour at a total estimated cost of $23,615.25.

In 1897 dredging, in connection with brush dams, was authorized, so as to secure a channel 50 feet wide and 6 feet deep through Lower Mud Lake.

The project for the improvement of Mermentau River and tributaries, as modified to date, provides for the removal of obstructions from the mouth of the Mermentau River to a point about 25 miles above the mouth of Bayou Nezpique and for a channel 50 feet wide and 6 feet deep through Lower Mud Lake. The improvement of Bayou Plaquemine Brule, a tributary of the Mermentau River, as authorized by act of June 25, 1910, is carried as a separate project, not yet being completed.

To June 30, 1912, there had been expended on the existing project the sum of $36,101.67, of which $9,986.42 was for maintenance.

The project is considered completed, the present work being for maintenance.

The improvements have resulted in unobstructed channels and increased depths on the Mermentau and Nezpique.

The maximum draft that can be carried at low water (mean low Gulf level) over the shoals in Lower Mud Lake and over the bar at the foot of Grand Lake is 3 to 4 feet.

The head of navigation on Bayou Nezpique is now at a point 25 miles above its mouth, on the other tributaries from 10 to 15 miles above their mouths.

The usual variations of the water surface in the upper portions of the Mermentau and its tributaries are from 8 to 15 feet, in the lower Mermentau about 2 feet, the fluctuations resulting from heavy winds being greater than those due to tides.

Comparative statement of shipments and receipts for 10 years.

Calendar year.	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
1902	50,326	21,085	
1903	63,690	13,364	
1904	45,866		17,824
1905	42,413		3,453
1906	61,634	19,221	
1907	49,756		11,878
1908	44,382		5,374
1909	33,094		11,288
1910	29,518		3,576
1911	23,362		6,156

On account of its location on this waterway the town of Mermentau has lower railroad rates on certain articles than intermediate points.

The funds estimated for expenditure during the fiscal year 1914 will be applied to maintenance of the work in accordance with the approved project, and is necessary to keep the improvement available.

(*c*) *Bayou Plaquemine Brule, La.*—The improvement of Bayou Plaquemine Brule, in accordance with project given in House Document No. 789, Sixtieth Congress, first session, at an estimated cost of $10,000, with $250 annually for maintenance, was authorized by the river and harbor act of June 25, 1910, and provides for the removal of snags, logs, and other obstructions, to provide a clear channel width of 60 feet and depth of about 6 feet, beginning at the mouth of the bayou and extending upstream to a point near the town of Crowley, a distance of approximately 29 miles.

Reports on preliminary examination or survey of Bayou Plaquemine Brule, with plan and estimate of cost of improvement, directed by the river and harbor act of March 2, 1907, were submitted December 19, 1907, and February 7, 1908, and are printed in House Document No. 789, Sixtieth Congress, first session. (Annual Report of the Chief of Engineers for 1908, p. 449.)

The existing project has not been modified since its adoption.

The entire length of the improvement will have to be gone over, removing the remaining trees and snags from the lower portion, and all from the upper reach of the work, and do the work of dredging where necessary. The work is not sufficiently advanced to permit navigation. No bench marks have been established.

The amount estimated for expenditure during the fiscal year 1914 is toward completion of work in accordance with the approved project and the work proposed is necessary to make the improvement available.

Consolidated.

Amount (estimated) required to be appropriated for completion of existing project	$21,200
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	16,200

INLAND WATERWAY FROM MERMENTAU RIVER, LA., TO SABINE RIVER, LA., AND TEX.

The purpose of the improvement is to provide a canal from Mermentau River, La., to Sabine River, La., which will be a continuation of the waterway from Franklin to Mermentau River, La., now in course of construction.

The original, which is the existing project, was adopted by Congress in the river and harbor act approved June 25, 1910, and contemplates a waterway, with a depth of 5 feet at mean low water and a bottom width of 40 feet, with proper side slopes, between the rivers named, in accordance with the reports submitted in House Document No. 640, Fifty-ninth Congress, second session, and Rivers and Harbors Committee, Document No. 3, Sixty-first Congress, second session, at an estimated cost of $390,000 and $20,000 annually for maintenance.

The act adopting the project authorizes the expenditure of the amount appropriated on any modified plan for that section of the waterway that may be recommended by the Chief of Engineers and approved by the Secretary of War. The right of way must be furnished without cost to the United States.

No modification has been made in the existing project since its adoption.

Operations during the year have consisted in the examination of various probable routes and the adoption, between the Calcasieu and Sabine Rivers, of the line for the greater portion of its length one-half mile north of the boundary line between Calcasieu and Cameron Parishes, making the connection between the Calcasieu and Sabine Rivers practically a straight line, and in efforts to secure the rights of way.

The route selected involves the expenditure of $27,000 more than the amount required for another route to the southward, but this difference in cost has been provided for by the voluntary contribution of that sum by local interests.

Deeds for this section of the waterway were submitted to the Attorney General for approval, and have been returned for minor corrections. These corrections are now being made and are about completed.

Specifications were prepared for dredging of this section, but advertisement will not be made until the right of way has been approved and the $27,000 contributed by local interests is placed in the hands of the disbursing officer for expenditure.

The rights of way are being procured for the section between the Mermentau and Calcasieu Rivers.

The amount expended during the fiscal year is $2,039.12 for survey and office expenses.

The total amount expended on the project up to the close of the fiscal year ending June 30, 1912, is $2,709.16.

There has been received from sales the sum of 40 cents.

The amount estimated for the fiscal year ending June 30, 1914, will be applied to the construction and completion of the waterway in accordance with the approved project.

The river and harbor act approved July 25, 1912, made an appropriation of $100,000, with the provision that this amount may be applied to any modified plan for this section of the waterway that may be recommended by the Chief of Engineers and approved by the Secretary of War.

Amount (estimated) required to be appropriated for completion of existing project	$190,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	190,000

RED RIVER BELOW FULTON, ARK.

Red River has its source in northwestern Texas and flows in a general easterly direction, forming the boundary between Texas, Oklahoma, and Arkansas. It enters the State of Arkansas about 10 miles north of Texarkana, and from Fulton, Ark., to Shreveport, La., its course changes to a general southerly direction. Below Shreveport its course changes to a general southeasterly direction, and, crossing the State of Louisiana, it enters Mississippi River at Red River Landing. The river is about 1,200 miles long. The section included in the project is 475.4 miles long, extending from Fulton, Ark., to the Atchafalaya River, La., 6.6 miles above the mouth.

The original project was entered upon in the river and harbor act of May 23, 1828, and contemplated improving navigation through or around the great Red River raft.

The project was amplified in the river and harbor act of July 13, 1892, to include the systematic clearing of the banks, to remove the source of drift and snags; continuing snagging operations and the removal of jams and raft; dredging towheads and shoals; constructing a substantial system of levees to fix the course of the river, either alone or by cooperating with riparian States; the closure of all outlets that deplete the river; the fixing of caving banks to confine the river to the selected channel; and the prevention of injuries to regimen by new cut-offs or outlets. The nature of the improvement requires that it be continued for many years, and no estimate for completion is given on this account.

There has been no modification since 1892 and the existing project is as stated in the preceding paragraph.

To maintain what has been accomplished and to gradually secure a more stable improvement will require a continuance of work for many years. The estimated cost is $75,000 a year, exclusive of extraordinary demands for new plant that will arise from time to time.

During the fiscal year ending June 30, 1912, work for maintenance of the improvement was continued as follows: Operations of snag boats, supplemented by those of shore parties during the period of low water, extended over the river between the head of Atchafalaya River, La., and Fulton, Ark. A large number of snags and other obstructions to navigation were removed or destroyed and the river within the limits of the project was kept in safe navigable condition.

A steel hull, self-propelling hydraulic dredge, with 6 pontoons and pipe line, was built under contract at Dubuque, Iowa, for maintenance of the improvement by dredging shoal places.

The amount expended from 1872 to the close of the fiscal year ending June 30, 1912, including $5,937.94 derived from sales, was $2,046,919.76, with the following chief results:

The channel cleared through the great raft in 1872–73 opened to navigation 176 miles of river above Shreveport to Fulton. Subsequent work secured the complete removal of the raft, prevented formations of the same nature, increased the width of the river 100 feet or more, and there now flows in the course laid out for it in the old raft region a broad and deep river, safe for navigation at all but the lowest stages. The survey of 1908 showed that the bed of the river in the old raft region above Shreveport had lowered in places as much as 25 feet. Incidentally the removal of the raft drained the fertile valley and reclaimed thousands of acres of productive lands. Tones Bayou outlet is closed by a heavy earthen dam, connected with the line of levee above and below it, and the main channel, for a time called "Little River," widened and scoured until navigation of the stretch became uninterrupted at low stages. All of the chief outlets along the right bank aboves Tones Bayou to the Arkansas-Louisiana line, 86 miles, have been closed with dams by cooperation with the State of Louisiana and local levee districts. Work at Alexandria Falls rendered them navigable at all stages. The channel was deepened from 2½ to 5½ feet at the lower falls and to 6 feet at the upper falls, lengthening the period of navigation about two months. Persistent snagging operations, repeated from year to year, kept the river opened and enabled steamboats to make regular trips, the river from Atchafalaya to Fulton ordinarily being open for boats of 3-foot draft at stages about a foot above zero of the Shreveport gauge. The maximum draft that can be carried at mean low water is 3 feet to Montgomery, La., 165 miles above the Atchafalaya; 2½ feet to Shreveport, 300 miles; and 2 feet to Fulton, Ark., 475 miles. Much of the work performed necessarily has been in repetition from time to time, and the items of improvement and maintenance are so closely allied that the cost of each can not be given separately.

At present steamboats seldom run above Fulton, Ark., but at high stages the river is navigable in fact to Denison, Tex., about 292 miles above Fulton, and about 767 miles above the Atchafalaya River.

Notwithstanding the facilities for quick transportation afforded by railways, the commerce of Red River until recent years consisted of large shipments of cotton, cottonseed and its products, lumber, staves, timber, etc., with heavy return freights of general merchandise and plantation supplies.

The commerce and navigation reported for the 18 years ending June 30, 1907, showed great variations, due to the changing crop conditions, occasional periods of extraordinary low water during the busy season, and other causes, ranging in quantity from 63,376 to 279,946 short tons per annum, with estimated values of from $1,506,-

500 to $9,185,000. The average for the 18 years was 123,244 short tons, valued at $4,359,900. To this should be added the commerce from Ouachita River, entering Red River at the mouth of the Black River, the average of which was 178,070 short tons, valued at $6,229,560, making a total of 301,314 short tons, valued at $10,589,460.

In 1908 there was a marked decline of navigation above the mouth of Black River, and the commerce reported in that stretch only amounted to 36,288 short tons, valued at $198,240. In 1909 it amounted to 69,885 short tons, valued at $154,789; in 1910 it amounted to 59,940 short tons, valued at $185,788; and in 1911 it amounted to 48,702 short tons, valued at $152,587.

The project effected a reduction of freight rates on all commodities.

The available funds will be applied to continuing the improvement, payment for construction of dredging plant, and maintenance.

The amount required for expenditure in the fiscal year ending June 30, 1914, will be applied to the operation of snag and dredge boats and further work on the existing approved project. This work is for maintenance and the extension of benefits.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$75,000

RED RIVER BETWEEN FULTON, ARK., AND THE MOUTH OF THE WASHITA, TEX.

Red River rises in northwest Texas near the New Mexico boundary line, flows slightly south of east approximately 800 miles to Fulton, Ark., thence southeastward to the Mississippi River. Approximate length, 1,375 miles. Length of project under Dallas office, from Fulton, Ark., to Denison, Tex., is 290 miles.

This part of the river was originally navigable for small boats during high stages only. The river at low water is a stream from 100 to 200 feet wide in the bends, winding in a shifting channel between banks which are frequently several hundred yards apart. The low-water depth varies from 1.5 to about 4 feet. The banks are covered with trees, constantly caving into the river and forming snags and drifts.

The original appropriation for work above Fulton was made August 5, 1886. The project contemplated improving only high and medium stage navigation by removing snags and drift. Previous to the existing project no work was provided for above the mouth of the Kiamichi River. The amount expended under previous projects is $33,500.

The river and harbor act of March 3, 1905, authorized the improvement of the river between Fulton, Ark., and Denison, Tex. The project contemplates the removal of drift and snags, clearing the banks of timber in danger of caving into the river, and closing chutes and cut-offs where necessary. No estimate of cost has been made.

At the close of the fiscal year ending June 30, 1912, $310,364.52 had been expended on this project, of which amount $10,189.66 was expended on survey of river between Fulton, Ark., and mouth of Washita River, Okla.

The river and harbor act of June 25, 1910, made an appropriation of $50,000 for this portion of the river, and provided that so much of this amount as shall be necessary may, in the discretion of the Secretary of War, be expended for removing snags, and other obstructions in the lower 25 miles of the Kiamichi River, a tributary of Red River, in the State of Oklahoma.

A quarter boat entered the Kiamichi River on December 11, 1911, and performed snagging operations on that river from that date until March 15, 1912, when it reentered Red River. The sum of $3,354.07 was expended in this work.

The part of the river over which the *C. A. Culberson* is working at first shows an increasing depth, but that part just above Fulton is now filling with snags and rapidly returning to its original condition.

Beyond the rafting of logs and timber there has been no commerce of any value on this section of the river.

The improvement of this section of the river may have some effect on local freight rates, but no effect on through rates is looked for unless navigation develops on the river below Fulton.

The river and harbor act approved July 25, 1912, adopts the additional project recommended in House Document No. 71, Sixty-first Congress, first session, which contemplates continuing the work now in progress under the existing project, with the addition of a small amount of annual dredging on the worst bars and the closure of certain chutes behind islands; also, by the addition of one small combined dredging and snag boat and one pile driver; the estimated cost of the new plant, including its operation, and also that of the existing plant for the first year being $100,000, for operation of the plant the second year, $60,000, and for future operation $50,000 annually. The act makes an appropriation of $75,000 for continuing improvement and for maintenance in accordance with above project.

The estimate submitted for the fiscal year ending June 30, 1914, is the minimum amount required to keep in operation the existing plant and to place in commission the combined snag boat and dredge contemplated by the new project. Although development of commerce is as yet small, it appears desirable to continue snagging operations to remove the most dangerous obstructions so as to permit of all boat traffic allowable by the natural-channel depths.

Amount (estimated) required to be appropriated for completion of existing project	[1] $25,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	42,000

GALVESTON HARBOR, TEX.

Galveston Harbor originally embraced an anchorage area of over 1,960 acres, of which 1,500 acres had a depth of more than 20 feet, 1,300 acres had a depth of more than 24 feet, and 460 acres had a depth of more than 30 feet.

The entrance was obstructed by two bars, known as the inner and outer. The natural depth on the inner bar was about 9 feet and on the outer bar about 12 feet. These shallow depths prevented all but the lightest draft vessels from using the harbor and necessitated the lighterage of cargoes to the larger vessels anchored in the deep water beyond the outer bar.

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[1] For construction of plant.

The area of the harbor is now about 258,496 acres, ranging in depth from 24 to 40 feet, of which 79,168 acres is properly the channel from ocean bar to anchorage. Of the 179,300 acres of anchorage about 119,400 acres are over 30 feet in depth.

From Galveston Harbor to Southwest Pass, mouth of Mississippi River, is a distance of about 410 miles east; to Aransas Pass, Tex., 188 miles west; to the mouth of the Brazos River, Tex., 50 miles west.

Prior to 1874 the projects for improving the harbor related to dredging operations on a small scale.

The project for the permanent improvement by jetties was adopted in 1874 and modified in 1880 and 1886. Previous to 1886, $1,478,000 was expended, with an additional sum of $100,000 subscribed by the city of Galveston in 1883.

The 1886 project provided for a certain depth of 25 feet and a possible depth of 30 feet by constructing jetties to a height of 5 feet above mean low tide and extending them to the 30-foot contour in the Gulf and supplementing the action of the tidal scour by dredging. The estimated cost of this revised project was $7,000,000.

The expenditures under the above projects resulted in 1900 in a depth of 26 feet at mean low tide on the outer bar, an increase of 14 feet since work began, and a depth of 26 feet at mean low tide on the inner bar, an increase of 16 feet during the same period.

The south jetty extended 35,603 feet and the north jetty extended 25,907 feet. The amount expended on this project was $7,041,684.42, of which $97,687.85 was for maintenance of the improvement.

The hurricane of September 8, 1900, damaged the jetties to a considerable extent, and a board of engineer officers estimated the cost of repairing the same at $1,500,000. (Annual Report of the Chief of Engineers for 1901, p. 2018.) Appropriations under this estimate commenced June 13, 1902, and were completed in 1906, $1,200,000 being appropriated.

The act of March 2, 1907, appropriated $300,000 and authorized continuing contracts for prosecuting the work to the amount of $700,000 additional, all of which has since been appropriated. In pursuance of the discretion vested in him by this act, the Secretary of War approved a project for expenditure of the funds appropriated and pledged in obtaining a depth of 30 feet by repairing the jetties, by jetty extension, and by dredging, including construction of a new dredge. This dredge, the *Galveston*, began work November 24, 1908.

Additional appropriations, amounting to $730,000, have also been made for maintenance by dredging and repairs to jetties. Of this amount $150,000 has been transferred to the work of improving Galveston Channel.

For more extended information see House Document No. 340, Fifty-ninth Congress, second session, and Rivers and Harbors Committee Document No. 11, Fifty-ninth Congress, second session.

From June 13, 1902, to June 30, 1912, $2,549,531.78 has been expended in accordance with modified project, of which $544,596.12 was for maintenance of improvement. The portion derived from miscellaneous sources, such as sales, etc., is $35,678.74.

The depth has increased from 12 feet, with a tortuous channel, in 1888 to a channel about 1,200 feet wide, fairly straight, with depth ranging from 30 to 33 feet. Just before the close of the fiscal year the Mallory Steamship Co. ceased using the services of the bar pilots, ship masters doing the work.

A ruling depth of 33 feet below mean low tide is found over the bar, with a channel across the bar midway between the jetties showing a least depth of 28½ feet at mean low tide. No dredging has been performed on Galveston Harbor for over 12 months.

From the outer bar to anchorage is a distance of about 4½ miles. Length of anchorage about 1 mile to the beginning of Galveston Channel.

It is difficult to state what the effect of the project has been upon freight rates. The rates on foreign shipments are much less than they were 10 years ago. Cotton, the chief article of export, of which 2,979,063 bales were exported in the past year, now has an average rate to Liverpool and Hamburg of 40 cents per 100 pounds and to Bremen 42 cents. Ten years ago the rate was 45 to 55 cents.

The deep water to the wharves and consequent elimination of lighterage charges, the increased size of the vessels employed, the presence of the tramp steamer that prevents the regular lines from keeping up the rates, and the increased production in the Southwest have all had their effect. For the effect upon coastwise rates, attention is invited to the remarks under the heading "Channel from Galveston Harbor to Texas City."

All the commerce for Galveston Channel, Texas City Channel, and Port Bolivar Channel comes in through this channel. In addition, the commerce for the Houston Ship Channel, bound in and out from the Gulf, uses this channel. The total volume of this commerce is approximately 3,793,273 short tons, valued at $427,016,385. For details of this tonnage and of the effect of the improvement on freight rates, attention is invited to the reports on the above channels.

It is proposed to expend about $100,000 of funds on hand on additional repairs to the jetties during the coming year.

It is proposed to apply the amount required for expenditure in fiscal year ending June 30, 1914, for maintenance in operating the dredge *Galveston*.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$50,000

GALVESTON CHANNEL, TEX.

This is the channel passing along the wharf front of the city and connecting the same with the jettied entrance channel.

Galveston Channel inside the inner bar had originally a depth varying from 20 feet at Fort Point to 30 feet off Twentieth Street, and again to 20 feet off Thirty-second Street. The width of the channel between the 18-foot contours was about 600 feet. The inner bar had originally a 9-foot depth, but conditions gradually became better until the outer bar, with about 12-foot depth, became the controlling factor. All vessels drawing over 12 feet had to complete their cargoes by lightering after crossing the bar.

Its distance by water to South West Pass, mouth of Mississippi River, is 418 miles east; Aransas Pass, Tex., is 188 miles west.

Appropriations by the United States Government for the channel began in 1902, when $100,000 was appropriated for improving the channel in accordance with the report submitted in House Document No. 264, Fifty-sixth Congress, second session. The act of March 3, 1905, authorized the construction of a dredge, *Col. A. M. Miller*, at a cost not to exceed $125,000.

The act of March 2, 1907, modified the project by providing for the extension of the channel from Fifty-first Street to Fifty-sixth Street, at an estimated cost of $129,310. (See H. Doc. No. 768, 59th Cong., 2d sess.) The act of June 25, 1910, further modified the project by providing, in the discretion of the Secretary of War, at such time as the interests of navigation and commerce demand, for the extension of said channel to Fifty-seventh Street, with a width of 1,000 feet between Fifty-first and Fifty-seventh Streets, in accordance with reports printed in House Document No. 328, Sixty-first Congress, second session.

The adopted project contemplates the excavation of a channel 30 feet deep and 1,200 feet wide from the inner bar to Fifty-first Street and the extension of said channel 1,000 feet wide from Fifty-first Street to Fifty-seventh Street.

The estimated cost of the project as modified is $1,769,710.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, is $1,309,128.48, of which $346,100.31 was applied to maintenance of improvement, and $1,975.57 was derived from miscellaneous sources, such as sales, etc.

The proportion of the approved project accomplished to June 30, 1912, is 57 per cent. The width of the 30-foot channel is as follows: From the outer red beacon to the dike, a distance of 6,350 feet, 500 to 1,000 feet; thence to Seventeenth Street, a distance of 4,500 feet, 600 to 800 feet; thence to Twenty-first Street, a distance of 1,500 feet, 900 to 1,200 feet; thence to Twenty-fifth Street, a distance of 1,600 feet, 700 feet; thence to Forty-third Street, a distance of 7,200 feet, 700 to 1,200 feet; thence to Forty-sixth Street, a distance of 1,200 feet, a narrow cut. Above this point no work has been done, a distance of 4,800 feet to Fifty-seventh Street. The total length of the channel is 5 miles. The variation of level of water surface is about 1 foot.

The maximum draft that can be carried at mean low water June 30, 1912, from deep water in the Gulf, is 32½ feet as far as Forty-sixth Street.

The commercial statistics for the port are as follows:

Calendar year.	Domestic exports.	Foreign imports.	Coastwise.	Total value.
1911	$215,178,801	$10,280,249	$146,297,574	$371,756,124
1910	206,678,617	4,741,396	166,720,049	378,140,062
1909	182,406,762	4,125,330	137,298,352	323,830,444
1908	202,152,984	5,516,822	218,388,000	426,057,806
1907	236,277,727	7,621,761	203,768,556	447,668.044
1906	170,759,269	3,772,090	349.486,007	524,017,366
1905	140,113,700	3,034,973	971,925,155	515,073,828

The business has increased from a yearly foreign export business in fiscal year 1895 of about $35,000,000 to $218,448,144 in the fiscal year ending June 30, 1912. This port stands second in the value of foreign exports of all the ports in the United States, as the following table shows:

[Compiled from official records published by the Bureau of Statistics, Department of Commerce and Labor, Washington, D. C.]

Ports.	1907-8	1908-9	1909-10	1910-11
New York	$701,062,913	$607,239,481	$651,986,356	$772,552,449
Galveston	161,352,201	189,464,335	173,178,992	220,504,917
New Orleans	159,455,773	144,981,625	140,376,560	172,835,293
Philadelphia	109,261,436	84,286,440	73,266,343	69,956,380
Boston	96,051,068	76,157,558	70,516,789	71,534,082
Baltimore	89,988,505	77,550,658	77,381,507	85,120,843
Savannah, Ga	61,695,330	50,900,156	63,428,155	72,076,045

It is difficult to state what the effect of the project has been upon freight rates. The rate on foreign shipments are much less now than they were 10 years ago. Cotton, the chief article of export, of which 2,735,303 bales were exported in the past year, now has an average rate to Liverpool and Hamburg of 40 cents per 100 pounds, and to Bremen 42 cents. Ten years ago the rate was 45 to 55 cents.

The deep water to the wharves and consequent elimination of lighterage charges, the increased size of the vessels employed, the presence of the tramp steamer that prevents the regular lines from keeping up the rates, and the increased production in the Southwest have all had their effect. For the effect upon coastwise rates, attention is invited to the remarks under the heading "Channel from Galveston Harbor to Texas City."

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintenance and the further widening of the channel.

Amount (estimated) required to be appropriated for completion of existing project	$494,794
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	325,000

CHANNEL FROM GALVESTON HARBOR TO TEXAS CITY, TEX.

Texas City, Tex., is on the mainland of Texas, about 8 miles northwest of the city of Galveston. The natural depth over the line of this channel before improvement was from 4 to 8 feet. The present general dimensions of the channel are: 34,500 feet long, 200 feet wide by 27 feet deep for the first 5,500 feet out from the wharf, 100 feet wide by 27 feet deep for the next 17,000 linear feet, 100 feet wide by 25 feet deep for the outer 12,000 linear feet.

During 1895 and 1896 a channel 16 feet deep was dredged by the Texas City Terminal Co. at an expense of $146,000. At the time of the adoption of the present project this channel had shoaled to its natural depth.

The river and harbor act of March 3, 1899, provided for deepening the channel north of Pelican Island from Galveston Harbor to Texas City, Tex., to a depth of 25 feet and a width of 100 feet at the bottom at a cost not to exceed $250,000.

The full amount had been expended on the work under this appropriation up to the close of the fiscal year ending June 30, 1905, the

Texas City Co. paying the expenses of superintendence, inspection, etc. The channel was dredged 100 feet wide on the bottom and 25 feet deep from Texas City wharves to 25 feet of water in Galveston Harbor, a distance of 34,000 feet.

In addition to the amounts mentioned above, the Texas City Co., according to figures furnished by them, expended $148,906.98 in completing channel, $172,734.58 in digging turning basin and slip, and in 1906 removed 698,222 cubic yards at a cost of $16,028.61 in maintaining channel.

This channel had been redredged three times, at an expenditure of $63,075.72, all of which was for maintenance.

The river and harbor act of June 25, 1910, enlarged the project by appropriating $100,000 for maintenance and for dredging within the limits recommended in the report submitted in House Document No. 328, Sixty-first Congress, second session, with maps, which contemplates extending the channel so as to connect it with the new slip excavated by the Texas City Terminal Co. in front of its new wharf at Texas City. The new channel dimensions are thus 30 feet deep and 200 feet wide, the estimated cost being $410,000.

The river and harbor act of February 27, 1911, made an appropriation of $50,000 and the act of July 25, 1912, $100,000 for continuing the improvement and for maintenance by dredging within the limits recommended in the above-mentioned document.

For modification of the stone dike, recommended in the above report to be placed on the north side of the channel, see House Rivers and Harbors Committee Document No. 1, Sixty-second Congress, first session.

During the present year the channel was redredged to a depth of 27 feet with width of 200 feet, for a distance of 4,400 feet, at the inner end. In this work $20,890.97 was expended for maintenance.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, is $503,941.30, of which $186,726.06 is for maintenance.

The proportion of the 30-foot project accomplished up to June 30, 1912, is 15 per cent. The old project depth of 25 feet has been attained several times, but shoaling very soon lessens the depth. The maximum draft that can be carried June 30, 1912, over the shoalest portion is 18.8 feet, but owing to the softness of the silt, vessels drawing from 20 to 23 feet can pass through the channel. The usual variation of water surface is about 1¼ feet.

The tonnage for the port of Texas City, Tex., has been as follows:

Calendar year.	Foreign exports and imports.		Coastwise, domestic.		Total.	
	Short tons.	Value.	Short tons.	Value.	Short tons.	Value.
1911	145,820	$28,372,487	303,867	$23,151,774	449,687	$51,524,261
1910	72,694	14,542,428	313,046	33,300,767	385,740	47,843,195
1909	38,799	3,074,444	141,200	31,064,000	179,999	34,138,444
1908	59,072	3,403,960	96,927	18,201,566	155,999	21,605,526
1907	58,245	4,466,173	19,219	2,401,600	77,464	6,867,773
1906	58,258	3,697,757	....	....	58,258	3,697,757
1905	60,321	5,362,977	....	....	60,321	5,362,977
1904	36,138	3,745,888	....	....	36,138	3,745,888

The effect of the project on freight rates has been beneficial, owing to the establishment of a line of steamers from New York to Texas City, thereby breaking up the rate agreement that had existed between the old lines between New York and Galveston. Prior to the establishment of this line in 1908 the rates by the steamship lines from New York and points in seaboard territory to points in Texas were the highest figures that ever were in effect, notwithstanding the fact that the deepening of the Galveston Harbor Channel had been continuously going on, and at that date the depth was about 30 feet. But with the competing line in operation to Texas City the rates were reduced on an average of 51¼ per cent and the volume of the business increased over 300 per cent. However, during the present fiscal year the rates were advanced again, the average increase being about 75 per cent over the rates of the previous year.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the present 25-foot channel and to increasing it to 30 feet as far as possible.

Amount (estimated) required to be appropriated for completion of existing project	$224,872
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	200,000

PORT ARANSAS, TEX.

(*a*) *Aransas Pass, Tex.*—Aransas Pass is on the south coast of Texas, 188 miles southwest of Galveston and 125 miles north of the Rio Grande, and is the outlet of Aransas Bay into the Gulf of Mexico. The area of the bay is about 80 square miles. It is connected with Corpus Christi Bay on one side and with the Mesquite, St. Charles, and Copano Bays on the other.

The depth over Aransas Bar has varied greatly—from 9 feet in 1852, 9½ feet in 1871, 7 feet in 1875, to 8¼ feet in 1887.

For projects and work done by the United States Government and private corporations at Aransas Pass, see Annual Report of the Chief of Engineers for 1898, page 1527 et seq.

Amount expended on the original and the modified Government project prior to operations under the Aransas Pass Harbor Co.'s project was $540,477.65, exclusive of $9,938.93 subscribed by the citizens of Rockport and Corpus Christi, Tex., and $5,000 appropriated for Board of Engineers to ascertain character and value of improvements of Aransas Pass Harbor Co.

The last appropriation had been expended in accordance with the project prepared by Maj. O. H. Ernst, Corps of Engineers, in 1887 (printed on pp. 1313 to 1315 of the Annual Report of the Chief of Engineers for 1888). This project called for two parallel jetties and the revetment of Mustang Island.

Under the provisions of the river and harbor act of March 3, 1899, the Aransas Pass Harbor Co., under date of March 27, 1899, released and surrendered all rights and privileges theretofore granted to it by Congress, including the jetty constructed at the entrance of the pass.

The United States Government thereupon undertook again the improvement.

A board of engineer officers (H. Doc. No. 119, 55th Cong., 3d sess., with map, published in Report of the Chief of Engineers, 1899, p. 1973) recommended the improvement by parallel jetties, but the work was confined by the acts of Congress of June 13, 1902, and March 3, 1905, to the completion of the north jetty in accordance with the design and specifications of the Aransas Pass Harbor Co., and to such additional work as should be necessary for strengthening the jetty and removing obstructions in the channel.

Work was completed in accordance with the above-mentioned specifications June 11, 1906, at a cost to the Government of $546,703.10, but after the completion of the north jetty the channel became steadily worse, approaching dangerously near the jetty, and finally a secondary channel, 600 feet wide and 6 feet deep, broke through the gap between jetty and shore, with the result that for all practical purposes the channel was on the north side of the jetty instead of the south side, as intended by the plan adopted by the Aransas Pass Harbor Co.

The project adopted by the river and harbor act of March 2, 1907, provided for improvement in accordance with plans submitted by the Board of Engineers for Rivers and Harbors in its report of December 22, 1906, printed in Rivers and Harbors Committee Document No. 5, Fifty-ninth Congress, second session. This project provided, in the main, for a south jetty parallel to the general direction of existing jetty and the extension shoreward of the north jetty to connect with St. Joseph Island, and later the extension of both jetties. The estimated cost of the work, including $100,000 for a dredge, was $1,288,699.50.

At the beginning of the present fiscal year a total of $1,157,500 had been appropriated, the last appropriation ($217,500) having been made by the river and harbor act of June 25, 1910, for completing the improvement in accordance with the report submitted in House Document No. 639, Sixty-first Congress, second session, by securing a channel depth of 20 feet, repairs to the north jetty, the removal of the old jetties, the removal of the steamship *Mary*, and dredging, at an estimated cost for this work of $277,500. The project of 1907 had been extended by these appropriations to repairing the north jetty, dredging, and removing obstructions in the channel; and had been diminished by omitting the seaward extension of 1,750 feet of the jetties. The cost of the revised project is now $1,157,500.

The sum of $25,000 was appropriated by the river and harbor act of February 27, 1911, for maintenance.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $1,149,363.87; of such amount $167,930.47 was applied to maintenance of improvement. From miscellaneous sources, such as sales, etc., $16.10 was derived.

The north jetty is 9,241 feet long and the south jetty 6,400 feet long.

The latest survey shows a channel 20 feet deep and 340 feet wide from end of the jetties to near Station C; thence a channel 20 feet deep and 250 feet to about 300 feet west of Station C, and 20 feet wide with good navigable width for the remainder of the length of the improvement.

The tonnage carried through the channel during the calendar year 1911 amounted to 8,880 short tons, valued at $863,000. The project has had as yet no permanent improvement on freight rates. Its effect on rates will soon, however, be felt, as it is understood that the Texas State Railway Commission favor prescribing rates on a parity with Galveston.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the project.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$50,000

(*b*) *Deep-water harbor at Harbor Island, Aransas Pass, Tex.*—A depth of 20 feet having been provided through Aransas Pass, it became necessary to establish a deep-water harbor or port for the shipping. The river and harbor act of February 27, 1911, provided for the establishment of such a harbor at Harbor Island, which lies opposite the entrance channel through the pass.

The project is in accordance with the report printed in House Document No. 1094, Sixty-first Congress, third session, and provides for a roadstead 20 feet deep, 1,200 feet wide, and 3,000 feet long between Harbor and St. Joseph Islands, and for a channel of similar depth, 400 feet wide and 5,420 feet long, leading from the northern end of the roadstead, and for a protective stone dike 10,000 feet long on St. Joseph Island, connecting with the north jetty. The estimated cost of the work was $375,000, with $25,000 annually for maintenance after completion.

The act made an appropriation of $125,000 and authorized continuing contracts in the additional sum of $250,000 for completion of the project, which amount was appropriated by the sundry civil act approved August 24, 1912. The act of 1911 provided also that no part of the appropriation and authorization should be expended until the Secretary of War is satisfied that the interests of the general public will be duly protected in the use of the harbor and that no terminal monopoly will be possible, and that the title and easements in any land needed in the construction of the dike proposed as a part of the improvement shall have been vested in the United States free of cost. In fulfillment of these conditions the Legislature of the State of Texas has passed a law prohibiting a terminal monopoly at this harbor, and deeds for the land required for the dike have been secured.

Work was, therefore, begun on this project October 27, 1911, and to the close of the fiscal year ending June 30, 1912, the amount expended has been $107,096.46, none of which was for maintenance.

During the year 10,000 linear feet of riprap dike on St. Joseph Island was completed under contract with D. M. Picton & Co., of Galveston, Tex., at a cost of $201,503.25.

Under contract of Bowers Southern Dredging Co., of Galveston, Tex., 53 per cent of the excavation for the deep-water harbor at Harbor Island was completed, at a cost of $77,570.02.

The ruling depth over that part of the deep-water harbor excavated was on June 30, 1912, 20 feet.

This project has had no effect on freight rates up to the end of the year.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the project.

Amount of continuing contract authorization, act of Feb. 27, 1911	$250,000
Amount appropriated under such authorization	250,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	50,000

(*c*) Following is the report of the board on a recent survey, printed in House Document No. 1125, Sixty-second Congress, third session:

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
December 9, 1912.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The Board of Engineers for Rivers and Harbors has had under consideration the within report of a special board on examination of Port Aransas, Tex., ordered in section 1 of the river and harbor act approved July 25, 1912, as follows:

"The Secretary of War may appoint a board of three Engineer officers, whose duty it shall be to examine Port Aransas (Aransas Pass and the Harbor Island Basin), Tex., and make an estimate of the cost of securing a depth of 25 feet, or such depth as may be considered advisable in the interest of commerce. And said board shall report fully upon all matters pertaining to the creation of a deep-water harbor of the first class, including the dike on St. Joseph Island and harbor facilities at the northern end of Mustang Island. And the said board shall also report whether the waters lying between Harbor Island and the mainland may be exempted from the operation of the laws relating to navigable waterways of the United States."

2. By the act of February 27, 1911, a project was adopted for the establishment of a deep-water harbor at this locality having a roadstead 20 feet deep, 1,200 feet wide, and 3,000 feet long in front of Harbor Island, and a channel of similar depth 400 feet wide and 5,420 feet long leading from the northern end of the roadstead. The project includes also the construction of a dike on St. Joseph Island. The special board states that the insufficiency of the proposed depth of 20 feet for future commerce was recognized at the time it was recommended. It appears that vessels are now calling at the port, and while the commerce is not great, a study of economic and transportation conditions throughout the tributary area of Texas leads the special board to believe that the inherent advantages of this locality can not fail to be recognized in the near future, especially in view of the increasing congestion of other existing routes of exportation. The work recommended by the special board and the estimated cost of the same are as follows:

Repairs to south jetty	$10,000
Repairs to north jetty	39,000
Extension of south jetty 2,250 feet	682,500
Extension of north jetty 1,950 feet	946,000
Extension of St. Joseph Island dike 9,100 feet	240,000
Dredging to 25 feet between jetties	164,500
Dredging to 25 feet in Harbor Island Basin	234,000
Dredging to 12 feet in approach to Port Aransas from Turtle Cove and Harbor Island Basin	9,000
Total	2,325,000

The estimate for maintenance is given at $25,000. The extension of the St. Joseph Island dike is regarded as necessary to prevent the possible cutting across the island and formation of another channel from Aransas Bay to the Gulf, while the 12-foot channel communicating with the northern end of Mustang Island is deemed desirable to obviate the necessity of light-draft boats landing directly on the Pass. The special board states that the right of way should be given for the dike on St. Joseph Island and that the construction of the 12-foot channel and basin should be contingent upon the construction of the necessary bulkheads by local interests.

3. With reference to that part of the item of law relating to the waters north of Harbor Island the special board recommends:

"That so much of the shallow waters between the mainland on one side and Harbor Island and the chain of islands northward thereof on the other side and northeasterly of the Aransas Pass Channel & Dock Co.'s artificial channel through Harbor Island to the town of Aransas Pass be exempted from the operations of the laws relating to navigable waterways of the United States, but that said exemption be not at this time made with regard to said artificial channel of the Aransas Pass Channel & Dock Co. or to the shallow waters southerly and westerly thereof."

4. After careful consideration of the information presented, the Board of Engineers for Rivers and Harbors concurs in the recommendations of the special board, believing that the work outlined is required to fully qualify this port for the important commercial uses for which it was created. The board therefore expresses the opinion that it is advisable for the United States to undertake the further improvement of Aransas Pass and Harbor to the extent above indicated, at a total estimated cost of $2,325,000. The work should be authorized under continuing contract, and the initial appropriation should be $500,000, with subsequent appropriations in such sums as will allow the work to be finished in three years.

5. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

Wm. T. Rossell,
Colonel, Corps of Engineers,
Senior Member of the Board.

CHANNEL TO PORT BOLIVAR, TEX.

Port Bolivar Channel is at the end of Bolivar Peninsula about 4 miles north of the city of Galveston. Before improvement there was no natural channel nor harbor at this locality. The depth in front of the Gulf & Interstate Railroad transfer wharf was about 9 feet at mean low tide.

The general dimensions of the harbor are, for the entrance channel, 200 feet wide, 30 feet deep, 3,000 feet long; for the turning basin in front of the wharves 1,000 feet square by 30 feet deep. The entrance channel connects deep water in Bolivar Roads with the turning basin. The river and harbor act of March 2, 1907, appropriated $50,000 for obtaining a channel 150 feet wide and 25 feet deep, with increased width at wharf, from Galveston Harbor to Port Bolivar, see House Document No. 719, Fifty-ninth Congress, first session.

The contract was completed in October, 1908. A slip and wharf were constructed by the Gulf & Interstate Railway Co. and the port was opened for commerce June 14, 1909.

The river and harbor act of June 25, 1910, enlarged the project by increasing the dimensions of the channel to 30 feet deep, 200 feet wide, with a turning basin 1,000 feet square, at an estimated cost of $91,080, in accordance with the report submitted in House Document No. 328, Sixty-first Congress, second session. (With map.)

During the present fiscal year redredging was done by contractor's dredge and by the Government dredge *Gen. C. B. Comstock.*

Work on the 30-foot project began May 24, 1911, and the project was completed March 16, 1912. The channel was completed to the dimensions of 30 feet deep and 200 feet wide, with turning basin 1,000 feet square by 30 feet deep. Cost for the year $83,144.64, of which $15,195.58 was for maintenance.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, is $211,655.85, of which $74,586.15 was applied to maintenance of improvement.

The maximum draft that can be carried June 30, 1912, at mean low water, over the shoalest part of the locality, is 25.6 feet. The variation of water surface is 1¼ feet.

The commercial statistics for the port are as follows:

Calendar year.	Short tons.	Value.
1911	231,702	$3,736,000
1910	180,666	6,964,531
1909	81,891	6,444,318
1908	50,000	5,578,705

Regarding the effect of the project upon freight rates, the principal article of commerce is lumber for export. The railroad rate from the mills to Port Bolivar has been from 1 cent to 3 cents per 100 pounds less than to Galveston; and the lumbermen report that they can effect a saving in handling charges of 35 cents per 1,000 feet b. m. over Galveston.

The amount required for expenditure in the fiscal year ending June 30, 1914, will be applied to the maintenance of the 30-foot channel.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$50,000

HARBOR AT SABINE PASS, AND PORT ARTHUR CANAL, TEX.

The dimensions of the harbor at Sabine Pass are: Width, 1,700 feet to 3,000 feet; depth, 25 feet to 35 feet. The distance from Sabine Docks to Galveston, Tex., is 80 miles in a southwesterly direction, and to New Orleans, La., is 435 miles in an easterly direction.

Prior to improvement there were depths of 18 and 17 feet, respectively, over the two bars in Sabine Pass, opposite the town of Sabine and opposite Fort Point. These bars were about 200 feet long. Throughout the other portions of the pass the least mean depth was 25 feet.

Beyond the shore line at the entrance to the pass there existed a bar about 3½ miles wide between the interior and exterior 18-foot bottom curves, over which there was not more than 6 feet of water at mean low tide. Channels 12 and 15 feet deep were dredged through this outer bar during 1878 and 1880, under the project of 1873, at a cost of $325,000, but they soon refilled.

The project of 1882 provided for the construction of parallel jetties at the entrance of the pass, 1,800 feet apart and about 4 miles in length from shore line to deep water in the Gulf, and for dredging the channel between these jetties if necessary. This work was designed to provide a channel of practicable width and a depth of 25 feet, at an estimated cost of $3,177,606.50.

Construction of the jetties began in 1883, and under successive appropriations has been carried on since that date.

The river and harbor act of 1896 authorized contracts for the completion of the project, limiting the cost to $1,050,000, all of which has been appropriated.

Under contract approved June 22, 1897, the east jetty was completed for a length of 21,818 feet, riprap work only was completed for a length of 682 feet, and foundation only for 2,600 feet. The west jetty had a length of 15,560 feet, of which 1,490 feet was only riprap work and 4,950 feet was foundation only. About 3,000 feet of previous work was capped.

Dredging in the channel was carried on, under contract, in 1897, 1898, and 1899, the depth being increased to 25 feet and the width to 100 feet. The channel was again dredged in 1900 and 1901, with an allotment of $8,000 from the emergency appropriation of June 6, 1900.

Under the act of March 3, 1899, $150,000 was appropriated for straightening, widening, and otherwise improving the harbor by the removal of oyster reefs and flats between the United States life-saving station and a point opposite the United States lighthouse. The work was completed April 18, 1903.

Act of June 13, 1902, appropriated $25,000 for widening and straightening the main ship channel and increasing its depth from a point 1,000 feet north of the life-saving station to the entrance of the Port Arthur Canal in accordance with report published in the Annual Report of the Chief of Engineers for 1901, page 1915. This work was completed February 27, 1903, and the channel depth was increased to 25 feet at mean low water for an average width of 400 feet.

The act of June 4, 1897, appropriated $100,000 for the construction of a dredge (the *Sabine*), which was completed January 14, 1901.

Since this date the dredge has worked in the channel between the jetties 93 months and 6 days and removed a total of 4,282,351 cubic yards. The remainder of the time she was either absent undergoing repairs or was engaged in emergency work at South Pass, Mississippi River.

The creation of the channel contemplated by the project has been completed. The existing project is for maintenance of a channel depth of 25 feet to be accomplished by dredging and the restoration of the jetties to a height of about 4 feet above mean low tide, at an estimated cost of $1,016,573.

At favorable stages of the tide vessels have gone out during the year drawing 26 feet. The usual variation of the tide is 1½ feet. By continued work the dredge *Sabine* is just able to maintain a channel of about 25 feet depth, and the low portions of the jetties should be built up to a height of about 4 feet above mean low tide.

The river and harbor act approved July 25, 1912, adopted a new project for this locality in accordance with plan printed in House Document No. 773, Sixty-first Congress, second session, which contemplates the repair and building up of the jetties as far as the mattress foundation is laid, so as to provide a reasonably permanent channel of 25 feet navigable depth; dredging Port Arthur Canal 26 feet deep and 150 feet wide; and dredging a new turning basin 26 feet deep, 600 feet wide, and 1,700 feet long; all at an estimated cost of $2,000,000, with $290,000 for maintenance the first year, including the price of a new dredge, and $190,000 annually for maintenance thereafter, subject to the condition that the right of way for the turning basin, estimated to cost $10,000, shall be furnished free of cost to the United States. The act makes an appropriation of $433,800.

The amount expended to June 30, 1912, was $4,526,154.89, of which $325,000 was expended on previous projects. Of the amount expended on the present project it is estimated that $686,740.71 has been applied to maintenance of improvement.

The amount required for expenditure in the fiscal year ending June 30, 1914, namely, $600,000, will be required for continuing the work of maintenance by dredging and for extending the jetties on the mattress foundation in accordance with the project submitted in House Document No. 773, Sixty-first Congress, second session, adopted by the river and harbor act approved July 25, 1912.

There were moved on this waterway during the calendar year 1911 2,443,962 short tons of miscellaneous freight, consisting of principally crude petroleum and its refined products, sulphur, cotton, lumber, rice, and general merchandise, valued at $49,864,181.

Comparative statement of shipments and receipts.

	Short tons.	Change in tonnage from previous year.	
		Increase.	Decrease.
Year ending May 31—			
1897	87,632	38,746	
1898	238,400	150,768	
1899	326,982	88,582	
Calendar year—			
1899	326,494		488
1900	217,489		109,005
1901	150,087		67,402
1902	689,688	539,601	
1903	1,315,248	625,560	
1904	1,792,371	477,123	
1905	1,779,954		12,417
1906	1,904,389	124,435	
1907	1,848,159		56,230
1908	1,802,307		45,852
1909	2,185,786	383,479	
1910	2,304,113	118,327	
1911	2,443,962	139.849	

The improvement at Sabine Pass has caused a reduction in the local freight rates as stated in previous annual reports, but the freight rates to Port Arthur and Sabine, Tex., consist of the through rate to Beaumont plus a certain differential, which is applied by the State railway commission to all seaports.

Amount (estimated) required to be appropriated for completion of existing project	$1,716,200
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	600,000

WEST GALVESTON BAY CHANNEL, TURTLE BAYOU, TRINITY RIVER, ANAHUAC CHANNEL, OYSTER CREEK, CEDAR, CHOCOLATE, AND BASTROP BAYOUS, TEX., INCLUDING MOUTHS OF ADJACENT STREAMS.

This project has embraced the improvement of the following localities: West Galveston Bay, the Galveston and Brazos Canal, Hanna Reef (East Bay Bayou), Double Bayou, Anahuac Channel, mouth of Trinity River, Turtle Bayou, Cedar Bayou, Clear Creek, Dickinson Bayou, Chocolate Bayou, Bastrop Bayou, Oyster Creek. (Annual Report Chief of Engineers, 1900, p. 2438 et seq.)

Prior to March 3, 1899, the improvement of West Galveston Bay and the Galveston and Brazos Canal, Double Bayou, mouth of Trinity River, and Cedar Bayou was independent. The river and harbor act of that date made an appropriation for the improvement of the Brazos River between Velasco and Richmond, West Galveston Bay Channel, Double Bayou, and the mouths of adjacent streams. The mouth of Trinity River and Cedar Bayou were transferred to this work, and Anahuac Channel was added by the act of March 3, 1905. Chocolate and Bastrop Bayous were added by the act of March 2, 1907, and Turtle Bayou and Oyster Creek by the act of June 25, 1910. As adjacent streams Hanna Reef (East Bay Bayou), Clear Creek, and Dickinson Bayou have been improved. Double Bayou has not been specially named in the act since 1905 and is now under improvement as an adjacent stream.

As the West Galveston Bay Channel and Galveston and Brazos River Canal have been included in the "Inland waterway on the coast of Texas," and appropriated for under that heading, allotments for these works under this appropriation have ceased.

The object of this improvement, in part, is to obtain and maintain a navigable channel depth of from 4 to 6 feet across the bars at the mouths of the streams and bayous from deep water in the bay to deep water in the bayous.

The improvement is intended to develop a light-draft inland navigation which will afford cheap transportation by light-draft steamers and barges to the coast country of Texas.

The estimated cost of the modified project has been given in previous reports as $248,646.34, but, as works originally embraced in this project have been transferred to other appropriations and new works have been added for which no estimate of cost have been made, there is no estimated cost for the entire project. All the channels called for have been completed, but maintenance is regularly required.

The amount expended on these improvements under present project to June 30, 1912, has been as follows:

Channel across Hanna Reef	$3,299.67
Double Bayou	19,261.09
Anahuac Channel	15,556.10
Mouth of Trinity River	12,726.57
Turtle Bayou	8,899.97
Cedar Bayou	17,707.10
Clear Creek	27,480.16
Dickinson Bayou	20,724.35
Bastrop Bayou	17,730.29
Chocolate Bayou	12,143.89
Oyster Creek	6,942.24
Dredge *Gen. H. M. Robert*	67,992.51
Dredge *Capt. C. W. Howell*	15,000.00
Total	245,463.94

Of this amount $83,646.23 was applied to maintenance of improvement, and $116.43 has been derived from miscellaneous sources, such as sales, etc.

By authority of river and harbor act of March 3, 1899, a pipeline hydraulic dredge was constructed for the improvement of these streams at a cost of $67,992.51. This dredge (*Gen. H. M. Robert*) was burned April 18, 1909, and the dredging has since been carried on by the dredge *Capt. C. W. Howell*. The latter, however, was lost at sea September 14, 1911, and there is now no plant available for light-draft work.

More and larger boats, especially power boats with schooner hulls, have been built to utilize the improvement. Most of the points reached are settlements not on railroads, and the improvements are of great importance to their commercial life.

The effect of these improvements has been generally to decrease freight rates to all points reached by the channels improved.

It is proposed to apply the amount required for expenditure in the fiscal year ending June 30, 1914, in dredging and snagging for maintenance of the channels now under improvement.

The river and harbor act approved July 25, 1912, made an appropriation of $25,000 for continuing improvement and for maintenance, including mouths of adjacent streams, but allotment to the various works has not yet been made.

(*a*) *Channel across Hanna Reef* (*East Bay Bayou*).—This is a channel across Hanna Reef, connecting lower Galveston Bay, East Bay, and East Bay Bayou, and is on the direct line of the inland waterway project. The natural depth was 2 feet at mean low tide.

Amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $3,299.67, of which $823.65 was applied to maintenance.

No work was done on this projcet during the fiscal year ending June 30, 1912.

By dredging across this reef vessels are allowed to proceed 16¼ miles farther up East Bay to the mouth of East Bay Bayou.

Maximum draft that can be carried June 30, 1912, is about 5.5 feet at mean low tide.

Variation of water surface, about 1 foot.

The commerce passing through this channel for the calendar year 1911 was 2,406 short tons, valued at $240,000.

(*b*) *Double Bayou.*—The navigation of this bayou was obstructed by a bar which prevented boats drawing over 2 feet of water entering the bayou.

The amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $19,261.09, of which $12,307.89 was applied to maintenance, exclusive of $2,711.40 deposited by private parties.

This expenditure has resulted in the excavation and partial maintenance of a channel 6,450 feet long, 60 to 80 feet wide, and from 5 to 7 feet deep across the bar and into the bayou.

No work was done during the fiscal year ending June 30, 1912.

Maximum draft that can be carried June 30, 1912, at mean low water is 2.7 feet.

The variation of water surface is about one-half foot.

This bayou within a half mile of its mouth divides into east and west branches, the east branch being navigable for 12 miles and west branch for 8 miles from mouth, making a total of 19½ miles.

For report on survey see House Document No. 387, Fifty-fifth Congress, second session (Report of the Chief of Engineers for 1898, p. 1512).

The commerce passing through this channel was for the calendar year 1911, 6,007 short tons, valued at $218,150.

(*c*) *Anahuac Channel.*—The original depth of this channel was about 3 feet.

Amount expended on work of existing project up to the close of the fiscal year ending June 30, 1912, was $15,556.10, of which $9,581 was for maintenance of channel.

The expenditure has resulted in the excavation and maintenance of a channel 16,013 feet long, 80 feet wide, and 7 feet deep from 6 feet of water in Trinity Bay to 8 feet of water in Browns Pass.

During the present fiscal year the redredging of the channel has been in progress, 6,600 feet having been gone over; redredging to depth of 6 to 8 feet and width of 50 feet, at an expenditure of $1,531.54.

Maximum draft that can be carried June 30, 1912, at mean low tide is 5.2 feet.

This channel is navigable for 3½ miles from the 6-foot contour in Galveston Bay to Anahuac.

Variation of water surface is about one-half foot.

The commerce for the calendar year 1911 was 26,385 short tons, valued at $740,010. Rice, the main agricultural product, and lumber are the principal items. The channel is used by the United States mail boats, and, as there is no railroad communication with the adjacent country, all produce and supplies pass through this channel.

(*d*) *Mouth of Trinity River.*—This river empties into Galveston Bay through several months or passes, opposite each of which a bar existed on which the depth of water did not exceed 3½ feet at mean low tide.

Under earlier projects, adopted June 18, 1875, and amended May 4, 1889, dredging and snagging were done, the west jetty at Middle Pass completed to a length of 7,359 feet, and a channel 100 feet wide by 5 feet deep secured at a cost of $75,900. (See Report of the Chief of Engineers, 1889, p. 1557.) The channel subsequently shoaled to a ruling depth of 3½ feet, and at present Browns Pass leading to the Anahuac Channel is the one used and under improvement.

Amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $12,726.57, of which $9,086.13 was applied to maintenance.

Under present project a channel 80 feet wide and 6 feet deep has been dredged a distance of 1,800 feet.

Maximum draft that can be carried June 30, 1912, at mean low water, 6.2 feet.

Variation of water surface is about one-half foot.

During the calendar year 1911 commerce to the amount of 1,293 short tons, valued at $233,097, passed through this channel.

There was no work during the year.

(*e*) *Turtle Bayou.*—Turtle Bayou empties into Turtle Bay, the head of Trinity Bay (part of Galveston Upper Bay). From Anahuac across Turtle Bay to the mouth of the bayou, 3½ miles, the channel had a depth of about 3 feet; the bar at the mouth had a depth of 2½ feet. Above this point the bayou has a depth of 16 feet for 5½ miles, 8 feet for 5 miles more, and 4 feet for 7 miles farther.

The present project, as adopted by the river and harbor act of June 25, 1910, calls for dredging a channel 4 feet deep and 50 feet wide from the mouth of Turtle Bayou across Turtle Bay to the foot of Browns Pass, near Anahuac, at a cost of $10,000.

Work began on this project February 14, 1911. The entire channel has been dredged by the Government dredge *Capt. C. W. Howell*, forming a channel 5 feet deep, 50 feet wide, and 15,895 feet long.

Amount expended on existing project to June 30, 1912, was $8,899.97, none of which was for maintenance.

No work was done on this project during the fiscal year ending June 30, 1912.

The maximum draft that could be carried June 30, 1912, was 4.1 feet. The stream is navigable to a point 17½ miles from the mouth.

The variation of water surface is about 1 foot.

Commerce passing through this channel was, for the calendar year 1911, 3,962 short tons, valued at $604,123.

For report on survey, see House Document No. 440, Fifty-sixth Congress, first session (Report Chief of Engineers, 1900, p. 2842).

(*f*) *Cedar Bayou.*—Cedar Bayou discharges into the northwest corner of Galveston Upper Bay at a point about 1½ miles below the mouth of the San Jacinto River and distant 28½ miles from Galveston.

The original project for this improvement was adopted September 19, 1890, and consisted in deepening the channel over the bar by dredging so as to afford a depth of 5 feet at mean low tide, and protecting the dredged channel by brush and stone walls or jetties. The amount previously expended on this project was $32,150.

After crossing the bar a least depth of 9 feet can be carried up the bayou for a distance of 17 miles.

Under present project the jetties were repaired by filling the lowest places and gaps with riprap, and a channel 8 feet deep, 80 feet wide, and 8,690 feet long was dredged from the 8-foot depth inside the bayou across Cloppers Bar and connecting with the 8-foot depth in San Jacinto Bay.

During the past fiscal year no work was done.

Amount expended on existing project to close of fiscal year ending June 30, 1912, was $17,707.10, of which $10,769.95 was applied to maintenance.

Maximum draft that could be carried June 30, 1912, 4.3 feet. This stream is navigable to Needle Point, head of navigation, a distance of 20 miles from the mouth.

For report of survey, see Report of Chief of Engineers, 1890, page 1815.

The commerce passing through the channel was for the calendar year 1911, 21,436 short tons, valued at $778,151.

(*g*) *Clear Creek.*—Clear Creek empties into Galveston Upper Bay from the west. It was obstructed at its mouth by a narrow sand bar on which the depth did not exceed 2 feet. For a distance of 2 miles about the mouth the ruling depth is 8 feet. It then broadens into a lake 3 miles long and 1½ miles wide, having before improvement an average depth of 1½ feet. Above the lake the prevailing depth is from 8 to 12 feet.

Private parties have at various times dredged through the bar at the mouth into Galveston Bay, and during 1907–8 the U. S. dredge *Capt. C. W. Howell* dredged a channel 22,847 feet long, 40 feet wide, and from 4 to 6 feet deep.

Amount expended on existing project to close of fiscal year ending June 30, 1912, was $27,480.16, of which $13,189.21 was applied to maintenance. During the present fiscal year no work has been done.

The maximum draft that could be carried June 30, 1912, at mean low tide across the bar in Galveston Bay at the mouth of Clear Creek was 4.1 feet, and across Clear Creek 5.3 feet.

This stream is navigable to Friendswood, at the head of navigation, a distance of 20 miles.

Variation of water surface is about one-half foot.

The commerce passing through the channel was for the calendar year 1911, 11,257 short tons, valued at $43,125.

(*h*) *Dickinson Bayou.*—Dickinson Bayou empties into Galveston lower bay about 20 miles northwest of the city of Galveston. Navigation was obstructed by a bar at its mouth with 2½ feet of water on its crest. After crossing the bar a depth of 10 feet can be carried up the bayou for 20 miles or more, and a depth of 6 feet for a distance of 25 miles from its mouth.

A channel from 6 to 6½ feet deep and about 60 feet wide over a distance of 19,100 feet through the shoal water of the bay and to deep water in the bayou had been dredged.

Amount expended on existing project to close of fiscal year ending June 30, 1912, was $20,724.35, of which $14,437.07 was applied to maintenance. During the present fiscal year no work has been done.

The maximum draft that can be carried June 30, 1912, at mean low tide over the bar is 4.2 feet.

This stream is navigable 10 miles from mouth to Galveston, Houston & Henderson Railway bridge for tugs and schooners. The same class of vessels could navigate to a point 25 miles from the mouth on removal of county and railway bridges.

For report of survey see House Document No. 448, Fifty-sixth Congress, first session, with map (Report of the Chief of Engineers for 1900, p. 2396).

Variation of water surface is 1 foot.

The commerce passing through this channel was, for the calendar year 1911, 4,783 short tons, valued at $16,650.

July 1, 1911, balance unexpended	$85.88
July 1, 1912, balance unexpended	85.88

(*i*) *Chocolate Bayou.*—Chocolate Bayou empties into Chocolate Bay, an arm of west Galveston Bay, about 12 miles north of San Luis Pass. At its mouth there is a bar with 3 feet of water on its crest. Above this bar the depth varies from 7 to 15 feet for 50 miles from its mouth.

Amount expended on work of existing project to close of fiscal year ending June 30, 1912, was $12,143.89, of which $5,631.67 was applied to maintenance.

A channel had been dredged 21,000 feet long from 5 feet of water in west Galveston Bay to 5 feet of water in Chocolate Bayou.

During the year some snagging has been in progress.

The maximum draft that can be carried June 30, 1912, at mean low tide over the shoalest part of the locality is 3 feet.

Variation of water surface, 1 foot.

This channel is used regularly by light-draft vessels a distance of 24 miles from its mouth to Liverpool. It is also navigable for 15 miles beyond Liverpool and navigation could be extended farther were it not for the overhanging trees along the banks, and snags.

The commerce passing through this channel was, for the calendar year 1911, 7,515 short tons, valued at $55,315.

Allotted from appropriation made by river and harbor act of Feb. 27, 1911	$3,500.00
June 30, 1912, amount expended during fiscal year, for works of improvement	17.60
July 1, 1912, balance unexpended	3,482.40
July 1, 1912, outstanding liabilities	1,135.80
July 1, 1912, balance available	2,346.60

(*j*) *Bastrop Bayou.*—Bastrop Bayou empties into Bastrop Bay, which is part of west Galveston Bay. The mouth of the bayou is 5 miles northwest of San Luis Pass and had a long shallow approach with only 10 inches of water on the bar. For 2 miles above the bar the water is shallow, averaging about 2 feet. Above that point there is, in general, a depth of 10 feet, but this depth was reduced by three shoals of a total length of about 3 miles with a depth of 2 feet. The stream can be navigated for a distance of 20 miles from its mouth.

A channel 400 feet long, 35 to 40 feet wide, and 4 feet deep was cut through the shell reef at the entrance to Bastrop Bay by the U. S. dredge and snag boat *Gen. S. M. Mansfield* in 1906 at a cost of $269.42, this amount being subscribed by interested parties.

During 1907 the U. S. dredge *Capt. C. W. Howell* cut a channel 18,765 feet long, 40 feet wide, and 4 to 5 feet deep up the bayou beyond three small shoals obstructing navigation.

Amount expended on work of existing project to close of fiscal year ended June 30, 1912, was $17,730.29, of which about $7,810.07 was for maintenance.

During the year there was no work and no expenditure.

The maximum draft that could be carried June 30, 1912, at mean low tide over the shoalest part of the locality was 2.6 feet.

Variation of water surface, 1 foot.

The commerce passing through this channel was for the calendar year 1911, 1,369 short tons, valued at $41,650.

(*k*) *Oyster Creek.*—Oyster Creek empties into the Galveston and Brazos Canal about 3 miles above the terminus of the canal at the Brazos River. For a distance of 2 miles above the junction with the canal the creek has a depth of less than 4 feet. Above that point it is navigable for boats with 4-foot draft for over 15 miles.

The present project, as adopted by the river and harbor act of June 25, 1910, calls for dredging in the creek to obtain a 4-foot channel. There has been no estimate of cost.

Work began on this project April 19, 1911, and to the close of the fiscal year ending June 30, 1912, the amount expended has been $6,942.24, none of which was for maintenance.

The maximum draft that can be carried June 30, 1912, over the dredged portion is 1½ feet. In the creek above there is a ruling depth of 3.7 feet. The stream is navigable to a point 5 miles above its mouth, where it is obstructed by a railway bridge.

The variation of water surface is 1 foot.

As far as known there is no commerce carried over this stream.

Consolidated.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$25,000

BRAZOS RIVER, TEX., FROM OLD WASHINGTON TO WACO.

The Brazos River rises in the plains of northwest Texas, flows southeasterly through the east central portion of Texas, and empties directly into the Gulf of Mexico at a point 45 miles southwest of Galveston Harbor. Its total length is about 950 miles. That portion of the river included under this project extends from Old Washington, 254 miles above the mouth, to Waco, 424 miles above the mouth, and is, therefore, 170 miles long. The profile of this section of river shows an alternating series of steep and gentle slopes, not navigable above Hidalgo Falls, 260 miles above the mouth of the river. The river has ordinarily such a small discharge that open-river navigation is impracticable.

In the river and harbor act of March 3, 1905, an examination of this section was ordered and a provisional appropriation for its improvement was made. In the act of March 2, 1907, a further appropriation was made, in accordance with a project submitted in a report published in House Document No. 705, Fifty-ninth Congress, first session. This project contemplates securing a navigable depth of 4 feet for four months and 3½ feet for six months of the year by constructing eight locks and dams and 103 miles of open-channel work, at a total cost of $2,915,000, the first lock and dam of the series being located at Hidalgo Falls.

The river and harbor act of March 2, 1907, authorized continuing contracts in the sum of $150,000, in addition to amounts already appropriated for the completion of the lock and dam at Hidalgo Falls, which amount has been appropriated.

From the amount of money appropriated by river and harbor act of March 3, 1909, the sum of $75,000 was allotted. This allotment was required in addition to the $300,000 to repair flood damages and to construct bank protection to prevent further erosion at the site of the lock.

The river and harbor act approved June 25, 1910, contains an item of $75,000 for the construction of Lock and Dam No. 8, about 7 miles below Waco, and the act of February 27, 1911, contained an appropriation of $50,000 for completion of the lock and dam at Hidalgo Falls; and the act of July 25, 1912, appropriated $200,000 for Lock and Dam No. 8 and two additional locks and dams.

No reduction in the freight rates in the territory tributary to this stretch of river can be expected until this portion, as well as that below Old Washington to about mile 55, is full improved.

To June 30, 1912, there has been expended on the present project $429,660.16, of which $58,359.27 was expended during the fiscal year 1912.

Delivery of the iron and steel to be used in the dam at Hidalgo Falls was completed during the month of October, 1910.

Contract was made November 18, 1911, for furnishing iron and steel for the lock, including gates, valves, operating mechanism, etc., and delivery was made during March, 1912.

All this iron and steel is now stored on the reservation, except such parts as it was necessary to build into the lock and dam in course of construction. It has been decided not to install the movable parts of this lock and dam at present, but to keep them in storage until such time as the project shall have been sufficiently completed to warrant affording navigation over Hidalgo Falls. This prevents the rapid deterioration and high cost of maintenance that would occur if all parts were installed before actually needed.

During the past fiscal year work was resumed November 17, 1911, and has comprised continuation of work on the weir and drift chute, the construction of a lock-tender's dwelling, the receipt of all iron and steel for lock, a survey of the lock site, etc. The total expenditures for the year on Lock and Dam No. 1 have been $22,029.09. The construction of this lock and dam is 90 per cent completed.

Work began on Lock and Dam No. 8 near Waco in December, 1911, and has consisted of construction of temporary quarters for workmen, the construction of a lock-tender's dwelling, the construction of a railway spur 2.8 miles long for the delivery of material, the purchase and assembling of plant, the purchase of miscellaneous material, the beginning of construction of a cofferdam for the lock, and the driving of foundation piles, all at a total cost to June 30, 1912, of $42,226.70.

This lock and dam is about 25 per cent completed.

For reference to reports of examinations and surveys, see Annual Report of the Chief of Engineers for 1907, page 452.

The river and harbor act of March 3, 1909, directed an examination of the Brazos River, with a view to the selection of sites for additional locks and dams between Old Washington and Waco. This examination has been made and the sites selected, report on which has been transmitted to Congress and printed in House Document No. 95, Sixty-second Congress, first session.

In his annual report for the fiscal year 1910 the Chief of Engineers expressed the opinion that in view of the large increase in cost of construction work and other changed conditions since this improvement was undertaken, the project should be reexamined with a view to revision. Since such a reexamination as was suggested has not been provided for in subsequent river and harbor acts enacted by Congress, and since appropriations have been made in such acts for lock and dam construction, it is assumed that it is the intention of Congress to continue the improvement by the construction of locks and dams.

Amount (estimated) required to be appropriated for completion of existing project	Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	$200,000

BRAZOS RIVER, TEX., FROM VELASCO TO OLD WASHINGTON.

This section of the river has a width of from 200 to 400 feet. It has good depth from the mouth to near the head of tidewater above Columbia (mile 36) and about a 4-foot navigable channel above that point to about mile 50.

The river has a very small low-water discharge. The flood discharge, though small, can not be carried in the channel, and the banks are overflowed during all large floods. The high banks erode readily, consequently the navigable channel is unstable, and open-river improvement difficult and expensive. A navigable channel of 4 feet exists only when the river is at a stage of about 4 feet, or possibly four months per year in intermittent periods.

The original project for this improvement was adopted June 3, 1896, and contemplated the removal of snags and overhanging trees and dredging troublesome shoals between Velasco and Richmond only. The sum of $5,000 was expended on this project.

In the river and harbor act of June 13, 1902, the improvement from Richmond to Old Washington was undertaken. In the act of March 3, 1905, this improvement was continued from Velasco to Old Washington. The project on which these appropriations were based (see Report of the Chief of Engineers, 1901, p. 1974) contemplated the improvement of the river by open-channel work between the mouth and Old Washington, at a cost of $225,000.

Amount expended on work of existing project up to June 30, 1912, was $325,251.24.

No advantage has been taken of the improvement above Columbia, principally on account of the fact that the characteristics of flow of the river are such that the periods during which the river can be navigated are indefinite as to time and duration.

The operations during the year consisted in the removing of obstructions by snagging and the cutting of trees on banks between mile 83 and mile 115. No work was done in the nature of jetty construction or repairs, and the work of that nature that has been done has either been obliterated or is of no further use.

Over this section of the Brazos River the depth is such that navigation can take place during a 6-foot stage of the river by boats having considerable power. No commerce of any note has developed nor can any be expected until the Brazos River is improved from its mouth up to Waco, or until the territory about the lower portion is given over more to agriculture than it is now.

An estimate of $25,000 is submitted as the amount required in addition to funds already available to operate the plant on hand for open-channel work so as to facilitate all traffic allowed by the natural channel depths and to prevent deterioration of present plant and channel.

The distances of the various places mentioned in the above report from the mouth of the river are as follows: Velasco, 5 miles; Columbia, 35 miles; Richmond, 99 miles; Old Washington, 254 miles; Navasota Lock, 259 miles; Waco, 424 miles.

The improvement has so far caused no effect on freight rates and no effect is looked for until the river is improved throughout.

For reference to reports of examinations and surveys, see Annual Report of the Chief of Engineers for 1907, page 453.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$25,000

MOUTH OF BRAZOS RIVER, TEX.

The Brazos River rises in the northwest portion of Texas, flows in a southerly direction for about 950 miles, emptying into the Gulf of Mexico 50 miles west of the Galveston entrance and 141 miles east of Aransas Pass.

The mouth of the river was originally obstructed by a shifting bar, about three-eighths of a mile from shore, the channel affording variable depths of water for navigation—of not over 8 feet at mean low tide and sometimes as shoal as 3 feet—being subject to changes due to winds and tides.

The present improvement includes a section of the river of about 6½ miles.

The original project was adopted in 1880 for the improvement of the channel over the bar by the use of jetties. The work was suspended in 1889. The amount expended on original project prior to operations under existing project was $142,098.43, and an additional sum of $5,000 for a board of engineers to ascertain character and value of improvements made by the Brazos River Channel & Dock Co.

After suspension of work by the United States the improvement of the mouth of this river was undertaken by the Brazos River Channel & Dock Co., which constructed two parallel jetties 560 feet apart. The northeast jetty was extended 4,708 feet long and the southwest 5,018 feet. In 1899 this company complied with the conditions of an act of Congress requiring a transfer to the United States of the jetties and auxiliary works; also a release of all rights and privileges conferred upon said company by its charter or by the act of Congress approved August 9, 1888, to charge or collect tolls for the use and navigation of said river.

For report of the board of engineers on character and value of the improvements made by the company, see Report of the Chief of Engineers, 1897, page 1815.

The existing project, approved July 11, 1899, was to repair and strengthen the jetties, construct spur dikes and bank protection, and to dredge a channel 18 feet deep and 150 feet wide. The estimated cost, $250,000, was increased by $175,000 after the hurricane of September 8, 1900. The project is completed. Dredging will always be necessary to maintain the channel.

As the result of an examination authorized by the river and harbor act approved March 2, 1907, the Board of Engineers for Rivers and Harbors arrived at the conclusion that for the present no further improvements should be made at the mouth of the Brazos River and that work under the existing project should be confined to the maintenance of the jetties, and this opinion was concurred in by the Chief of Engineers. (See H. Doc. No. 1087, 60th Cong., 2d sess., with map.)

The river and harbor act of February 27, 1911, appropriated $100,000 for dredging and repairs to the jetties. This money and the available balance was applied to procure an 18-foot channel to the railroad wharf; also to repairing the northeast jetty, the contract for which is not yet completed.

During the year a channel 18 feet deep and 150 feet wide was excavated up to the railroad wharf, a distance of about 2½ miles, under contract with the Bowers Southern Dredging Co., of Galveston, Tex., at a cost of $87,849.07.

Under contract with Chas. Clarke & Co., of Galveston, Tex., work on repairs to northeast jetty was begun, and at the end of the year 50 per cent completed, at an expense of $12,651.85.

The amount expended on the work of existing project up to close of fiscal year ending June 30, 1912, was $405,631.87, of which $13,557.86 was applied to maintenance. The portion derived from miscellaneous sources, such as sales, etc., is $11.92.

The latest information shows a minimum depth on the bar, beyond the jetties, of 18 feet at mean low tide, and from the outer end of the jetties to the wharf of 13½ feet. The length of the improved section is 6½ miles. Mean range of tide, 1.77 feet.

The present head of low-water navigation on the river is at Bolivar Landing, 40 miles above the mouth. On a small rise the river can be navigated to Richmond, a distance of 99 miles.

During the year steamers of the Seaboard & Gulf Steamship Co. used the channel, and during the calendar year 1911 carried through the channel 3,063 short tons, valued at $759,678.

This improvement has had some effect on ocean freight rates on competing lines to Galveston.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the project.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$25,000

TRINITY RIVER, TEX.

The Trinity River rises in north central Texas and flows approximately 675 miles southeasterly to Galveston Bay. The lower 512½ miles, from Dallas, Tex., to Galveston Bay, is under project in the Dallas district.

The river above tidal action is a narrow stream with a low-water depth insufficient for even light-draft navigation. Its banks, while generally high and quite stable, are subject to overflow during every flood of the river, and the adjacent bottom lands are overflowed. The improvement of the river for navigation by the method of canalization may somewhat complicate the flood problem.

The river and harbor act of June 13, 1902, adopted a project for the improvement of this stream in accordance with a report submitted in House Document No. 409, Fifty-sixth Congress, first session, making an appropriation of $125,000, and authorized continuing contracts in the sum of $275,000 additional for carrying out the work, all of which has since been appropriated. (See Annual Report of the Chief of Engineers for 1900, p. 2348.) This project contemplated improvement to provide a 6-foot navigation from Dallas to the mouth, a distance of 511 miles, by open-channel work and a system of locks and dams.

The original estimate of cost of this improvement was $4,550,000. The portion of this applicable to section 1 ($350,000) was afterwards raised to $918,000 in a report from a board of engineers appointed to examine into the cost. (See Annual Report of the Chief of Engineers for 1904, p. 2021.)

The amount expended on this improvement up to June 30, 1912, was $1,145,691.06.

Locks and Dams Nos. 1, 2, 4, and 6 have been authorized in section 1, and Lock and Dam No. 7 and locks and dams at Hurricane and White Rock Shoals have been authorized in the portion of the river below section 1. Locks and Dams Nos. 1 and 6 have been completed.

Contracts were entered into in 1908 for the construction of Locks and Dams Nos. 2 and 4, but the contractor abandoned work on these contracts during the fiscal year 1911, and since then the work of completing the locks and dams has been carried on by hired labor.

Work on the construction of Lock and Dam No. 7 was begun during the fiscal year.

Work on the construction of the lock and dam at Hurricane Shoals was continued during the fiscal year. A railroad (narrow gauge) from this lock site to Crockett, Tex., was under construction during the year, being completed to within 1½ miles of the site at the close of the year.

The work of construction of lock and dam at White Rock Shoals was begun during the fiscal year.

Lock No. 1 is at McComas Bluff, 13 miles below Dallas; the dam at Parsons Slough is 22 miles below Dallas; and Locks Nos. 2, 4, and 6 are 23, 30, and 42 miles, respectively, below Dallas. Lock and Dam No. 7, lock and dam at Hurricane Shoals, and lock and dam at White Rock Shoals are approximately 49, 243, and 334 miles below Dallas, respectively.

Snagging operations were carried on by means of one snag boat and three quarter boats.

The expenditures made in cleaning the river have resulted in no increased depth, but the removal of snags and drifts has made the stream safer to navigate at medium and high stages. There is no navigation above Liberty other than the rafting of logs.

Owing to the fact that the river is not yet navigable to Dallas, the only place at which it can come into active competition with the railroads, no effect on freight rates has been produced.

While the increased facilities due to removal of obstructions from this river have not been taken advantage of by local interests above Liberty and seem to have no value except in connection with a systematic improvement of the river by locks and dams, an estimate of $15,000 is submitted as the minimum amount required for the fiscal year 1914 to operate plant on hand for open-channel work, so as to facilitate all boat traffic allowed by natural-channel depths and to prevent deterioration of present channel.

The estimate submitted for lock and dam construction is the amount in addition to the amount probably on hand June 30, 1913, which can be advantageously expended during the fiscal year 1914 by hired labor in the construction of locks and dams heretofore authorized by Congress, as follows:

Lock and dam at Hurricane Shoals	$85,000
Lock and Dam No. 7	85,000
Lock and dam at White Rock Shoals	85,000
	255,000

If additional locks and dams are authorized by Congress, provision should be made by appropriations sufficiently large to permit of economical prosecution and prompt completion of the work undertaken. In order that the cost of construction may be kept within reasonable limits it is desirable that any locks and dams authorized in future by Congress for this river be constructed in such order as will permit such advantage as is possible to be taken of existing railroad crossings and of the pools formed by those dams previously constructed in arranging for transportation of materials to the locks and dams under construction. If this is not done and it is necessary to haul materials for construction overland to the lock sites the cost of the system will be very much greater than is necessary and much additional time will be required to complete the improvement.

If Congress does not decide that the locks and dams shall be built in order upstream, beginning with that one farthest downstream, it is recommended that at least those dams be built first which are located just below railroad crossings, to be followed by those next above such dams, etc. This will, in general, permit of the maximum possible economy of construction and will also create navigable stretches of the river each connecting with a railroad, thus facilitating the development of commerce.

Attention is invited to the remarks of the district officer on this subject in the appendix to this report.

The river and harbor act approved July 25, 1912, contains the following item:

> Improving Trinity River, Tex.: Continuing improvement with a view to obtaining a depth of 6 feet between the mouth and Dallas by the construction of locks and dams heretofore authorized, and for an accurate instrumental survey of the river as recommended in the Annual Report of the Chief of Engineers for 1911, $425,000; continuing improvement and for maintenance by open-channel work, $15,000; in all, $440,000.

Open-channel work.

July 1, 1911, balance unexpended	$54,064.68
Amount received from sales of condemned property, etc	49.00
	54,113.68
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	44,199.65
July 1, 1912, balance unexpended	9,914.03
July 1, 1912, outstanding liabilities	1,312.13
July 1, 1912, balance available	8,601.90
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	23,601.90
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	[1] 15,000.00

Section 1.—Federal appropriation.

July 1, 1911, balance unexpended	$11,228.00
Amount received from sale of plant to Locks and Dams Nos. 4 and 7 and lock and dam at Hurricane Shoals	7,900.00
Amount received from sales of condemned property, etc	422.55
	19,550.55
June 30, 1912, amount expended during fiscal year, for works of improvement	19,550.55
Amount allotted from appropriation made by river and harbor act approved July 25, 1912	25,000.00
Amount available for fiscal year ending June 30, 1913	25,000.00

Section 1.—Funds contributed by citizens of Dallas, Tex.

July 1, 1911, balance unexpended	$9,741.65
June 30, 1912, amount expended during fiscal year, for works of improvement	9,741.65

Lock and Dam No. 2.—Section 1 and funds contributed by citizens of Dallas, Tex.—Consolidated.

July 1, 1911, balance unexpended	$20,969.65
Amount received from sale of plant (by transfer of funds)	7,900.00
Amount received from sale of condemned property	422.55
	29,292.20
June 30, 1912, amount expended during fiscal year, for works of improvement	29,292.20
Amount allotted from appropriation made by river and harbor act of July 25, 1912	25,000.00
Amount available for fiscal year ending June 30, 1913	25,000.00

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[1] Exclusive of amount available for fiscal year 1913.

Lock and Dam No. 4.

July 1, 1911, balance unexpended		$122,741.20
Amount received from sales of condemned property, etc		172.25
		122,913.45
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$93,930.87	
For works of improvement, account of purchase of plant from "section 1," Trinity River (by transfer of funds)	1,400.00	
		95,330.87
July 1, 1912, balance unexpended		27,582.58
July 1, 1912, outstanding liabilities		3,760.21
July 1, 1912, balance available		23,822.37
Amount allotted from appropriation made by river and harbor act of July 25, 1912		100,000.00
Amount available for fiscal year 1913		123,822.37
July 1, 1912, amount covered by uncompleted contracts		6,180.00

Lock and dam at Hurricane Shoals.

July 1, 1911, balance unexpended	$180,068.00
June 30, 1912, amount expended during fiscal year, for works of improvement	89,085.73
July 1, 1912, balance unexpended	90,982.27
July 1, 1912, outstanding liabilities	17,356.33
July 1, 1912, balance available	73,625.94
July 1, 1912, amount covered by uncompleted contracts	3,969.53
Amount (estimated) required to be appropriated for completion of existing project	[1] 160,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 85,000.00

Lock and Dam No. 4 and lock and dam at Hurricane Shoals—Consolidated.

July 1, 1911, balance unexpended		$302,809.20
Amount received since from sale of condemned property, etc		172.25
		302,981.45
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$183,016.60	
For works of improvement on account of purchase of plant from "section 1," Trinity River, by transfer of funds	1,400.00	
		184,416.60
July 1, 1912, balance unexpended		118,564.85
July 1, 1912, outstanding liabilities		21,116.54
July 1, 1912, balance available		97,448.31
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		100,000.00
Amount available for fiscal year 1913		197,448.31
July 1, 1912, amount covered by uncompleted contracts		10,149.53
Amount (estimated) required to be appropriated for completion of existing project		[2] 160,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[2] 85,000.00

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[1] Exclusive of the balance unexpended July 1, 1912.

[2] Exclusive of amount available for fiscal year 1913.

Lock and Dam No. 7.

July 1, 1911, balance unexpended		$24,311.99
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$2,893.53	
For works of improvement, account of purchase of plant from section 1, Trinity River, by transfer of funds	3,250.00	
		6,143.53
July 1, 1912, balance unexpended		18,168.46
July 1, 1912, outstanding liabilities		1,105.41
July 1, 1912, balance available		17,063.05
Amount allotted from appropriation made by river and harbor act approved July 25, 1912		200,000.00
Amount available for fiscal year 1913		217,063.05
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[2] 85,000.00

Lock and dam at White Rock Shoals.

July 1, 1911, balance unexpended		$23,974.18
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$4,003.74	
For works of improvement, account of purchase of plant from section 1, Trinity River, by transfer of funds	3,250.00	
		7,253.74
July 1, 1912, balance unexpended		16,720.44
July 1, 1912, outstanding liabilities		797.63
July 1, 1912, balance available		15,922.81
Amount (estimated) required to be appropriated for completion of existing project		[2] 200,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[2] 85,000.00

Lock and dam No. 7 and lock and dam at White Rock Shoals—consolidated.

July 1, 1911, balance unexpended		$48,286.17
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$6,897.27	
For works of improvement, account of purchase of plant from "section 1," Trinity River, by transfer of funds	6,500.00	
		13,397.27
July 1, 1912, balance unexpended		34,888.90
July 1, 1912, outstanding liabilities		1,903.04
July 1, 1912, balance available		32,985.86
Amount allotted from appropriation made by river and harbor act of July 25, 1912		200,000.00
Amount available for fiscal year 1913		232,985.86
Amount (estimated) required to be appropriated for completion of existing project		[1] 200,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement		[1] 170,000.00

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[1] Exclusive of amount available for fiscal year 1913.

[2] Exclusive of the balance unexpended July 1, 1912.

Instrumental survey.

Amount allotted from appropriation made by river and harbot act approved July 25, 1912	$100,000.00
Amount available for fiscal year ending June 30, 1913	100,000.00

Consolidated.

July 1, 1911, balance unexpended		$426,129.70
Received since from sales of condemned property, etc		643.80
		426,773.50
June 30, 1912, amount expended during fiscal year:		
For works of improvement	$219,206.07	
For maintenance of improvement	44,199.65	
		263,405.72
July 1, 1912, balance unexpended		163,367.78
July 1, 1912, outstanding liabilities		24,331.71
July 1, 1912, balance available		139,036.07
Amount appropriated by river and harbor act approved July 25, 1912		440,000.00
Amount available for fiscal year ending June 30, 1913		579,036.07
July 1, 1912, amount covered by uncompleted contracts		10,149.53
Amount (estimated) required to be appropriated for completion of existing project		[1] 260,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance		[1] 270,000.00

CHANNEL FROM ARANSAS PASS TO CORPUS CHRISTI, TEX.

Corpus Christi is situated on the western side of Corpus Christi Bay, 20.3 miles from Aransas Pass. A natural depression, known as Turtle Cove, started at Aransas Pass and, passing between Harbor and Mustang Islands, led to the eastern end of Corpus Christi Bay. It had an approximate depth of 1½ feet at mean low tide. The distance through Turtle Cove to 8 feet of water in the bay was about 6 miles. The natural depth in the bay to Corpus Christi varied from 8 to 14 feet.

Under a previous project a channel 8½ feet deep at mean low tide and 75 feet wide at the bottom through Turtle Cove was authorized in 1907 and completed in 1909 as a part of the inland waterway on the coast of Texas. The total amount spent under this appropriation was $126,723.57. (See (*e*) Turtle Cove Channel between Aransas Pass and Corpus Christi, Annual Report of the Chief of Engineers for 1912, p. 712.)

The present project, as adopted by the river and harbor act of June 25, 1910, provides for a 12-foot channel with bottom width of 100 feet through Turtle Cove Channel and Corpus Christi Bay, between Aransas Pass and Corpus Christi, in accordance with report printed in House Document No. 678, Sixty-first Congress, second session. The estimated cost, including $50,000 for the construction of a dredge for maintenance, was $207,900, with $35,000 annually for maintenance.

During the year 40,200 linear feet of channel was dredged to a depth of 12 feet of water in Corpus Christi Bay, at an expenditure of $105,083.01, completing about 90 per cent of the proposed work.

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[1] Exclusive of amount available for fiscal year 1913.

At the close of the fiscal year ending June 30, 1912, the amount expended had been $129,687.88, none of which was for maintenance. The work consisted of dredging by contract to form the adopted channel.

The maximum draft that can be carried June 30, 1912, at mean low water, over the shoalest part of the locality is 9.9 feet. The variation of water surface is about 1 foot.

The channel is navigable throughout its length of 10 miles.

The amount of commerce carried through the channel is the same as carried through Aransas Pass, being 8,880 short tons, valued at $863,000.

Rates have been reduced on general merchandise 20 per cent less than railroad rates, and on cotton the rate has been reduced 13 cents per 100 pounds.

The report upon which this project is based contained an estimate of $50,000 for construction of a dredge to be used in maintaining the channel.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the project.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$10,000

CHANNEL FROM PASS CAVALLO TO PORT LAVACA, TEX.

The bar at Pass Cavallo is 125 miles from the Galveston Bar and 54 miles from the Aransas Pass Bar. Port Lavaca lies 26 miles to the northward of the pass across Matagorda and Lavaca Bays. The depth of water in the bays is over 7 feet, but across two reefs over which the channel passes the depth was reduced to about 6 feet.

The present project, adopted by the river and harbor act of June 25, 1910, according to House Document No. 1082, Sixtieth Congress, second session, with maps, provides for a channel 7 feet deep and 80 feet wide to Port Lavaca, at an estimated cost of $10,000, with an increased annual expenditure for maintenance of $2,500.

Work began on this project November 4, 1910, and was completed December 11, 1910, the required channel having been obtained by dredging. Up to the close of the fiscal year ending June 30, 1912, the amount expended was $9,699.48, none of which was for maintenance. The project is completed.

The maximum draft that can be carried June 30, 1912, at mean low water over the shoalest part of the locality, is 7 feet. The variation of water surface is about 1 foot.

The tonnage carried through the channel during the calendar year 1911 amounted to 734 short tons, valued at $25,025. The improvement has had no known effect upon freight rates.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the project.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

INLAND WATERWAY ON THE COAST OF TEXAS.

The river and harbor act of March 2, 1907, appropriated $133,829 and authorized the Secretary of War to enter into contract for materials and work to the extent of $300,000, all of which has since been appropriated.

In addition, $192,000 has been appropriated for maintenance.

This project embraces the improvement of the following localities: West Galveston Bay and Brazos River Canal; channel from Aransas Pass to Pass Cavallo, including the Guadalupe River to Victoria; Turtle Cove Channel from Aransas Pass to Corpus Christi, Tex.

The river and harbor act of June 25, 1910, appropriated $200,000 toward the construction of the section of the waterway between Brazos River and Matagorda Bay, in accordance with the report printed in Rivers and Harbors Committee Document No. 3, Sixty-first Congress, second session. The estimated cost of the entire section, 5 feet depth and 40 feet width, is $400,000. With the completion of this section the entire waterway between Galveston and Corpus Christi, a distance of 200 miles, will be opened up.

The object of the improvement is to obtain and maintain a navigable channel depth of 5 feet in a canal along the coast of Texas, utilizing the lagoons lying between the islands and the mainland. The improvement will develop a light-draft inland navigation which will afford cheap transportation by light-draft steamers and barges to the coast country of Texas.

The amount expended under this appropriation to June 30, 1912, has been as follows:

West Galveston Bay and Brazos River Canal	$175, 419. 93
Channel between Brazos River and Matagorda Bay	77, 880. 88
Aransas Pass to Pass Cavallo	72, 597. 54
Guadalupe River	182, 495. 60
Turtle Cove Channel	126, 723. 57
Total	635, 117. 52

Of this amount $78,628.42 has been for maintenance and $2,298.02 has been derived from miscellaneous sources, such as sales, etc.

The projected channels have been obtained, except the river channel from Victoria to the mouth of the Guadalupe River and the channel between Brazos River and Matagorda Bay.

More and larger boats with auxiliary gas engines have been built to utilize the improvement. Most of the points to be reached are settlements which railways can not afford to develop, and the improvements are of great importance to their commercial life.

The effect of the project on freight rates is shown by one instance—from Galveston to the plantations on the lower end of the Guadalupe. The rate by rail to the nearest point and by boat to the river landing is 63½ cents per 100 pounds on general merchandise; the all-water route rate is 35 cents. The combined cotton rate is $2.90 per bale and the all-water rate $1 per bale.

(*a*) *West Galveston Bay and Brazos River Canal.*—Previous to 1908 these channels were carried under another appropriation, viz, "West Galveston Bay Channel, Tex., and mouths of adjacent streams, etc."

West Galveston Bay.—This is a body of water covering about 39 square miles and lies between Galveston Island and the mainland. It extends from Galveston Bay to the west end of Oyster Bay and is connected with the Gulf of Mexico by San Luis Pass at the western extremity of Galveston Island and with the Brazos River by the

Galveston & Brazos River Canal. The minimum depth of the bay was from 2½ to 3 feet.

The former project, adopted July 13, 1892, and modified in 1896, contemplated a least depth of 5 feet, at an estimated cost of $28,998.80.

The work done resulted in a channel 100 feet wide and 3 to 3½ feet deep from Galveston Bay to the Galveston & Brazos River Canal. Beacons were also erected to define the channel. The channel subsequently shoaled to 18 inches in places.

Amount expended, including maintenance to close of the fiscal year ending June 30, 1907, was $35,059.69.

Galveston & Brazos River Canal.—This canal was originally dredged by the Galveston & Brazos Navigation Co. The original cut was 10 miles long (made in 1851–1853), 100 feet wide at bottom, and 6 feet deep. Steamboats from 145 to 175 feet long and from 28 to 30 feet wide used the canal, carrying from 550 to 1,200 bales of cotton.

The United States purchased the canal in December, 1902, at a cost of $30,000. The canal when acquired by the United States was badly obstructed with snags, drift, and silt.

Previous to June 30, 1907, the canal had been dredged for practically its entire length to a depth of 3 feet at mean low tide and width of from 35 to 40 feet. The bank had been reenforced at various points by brush.

The amount expended by the United States on the canal up to the close of the fiscal year ending June 30, 1907, was $67,307.66, of which $30,000 was for purchase of canal and $3,203.97 was applied to maintenance.

The existing project, combining this channel and West Galveston Bay Channel under one appropriation, was adopted by the river and harbor act of March 2, 1907, and provides for a channel 40 feet wide and 5 feet deep, at an estimated cost of $151,529 and $20,000 annually for maintenance.

For report of examination upon which this project is based, see House Document No. 640, Fifty-ninth Congress, second session, with map.

The amount expanded on existing project to close of fiscal year ending June 30, 1912, was $175,419.93, of which $40,928.39 was for maintenance of the improvement. Of this amount $2,283.62 was derived from miscellaneous sources, such as sales, etc.

There was no work during the year. The expenditure of $208.74 was for surveys, office expenses, etc., and was applied to maintenance.

The project has been completed in that the projected depths have been attained, but maintenance is regularly required, and the additional appropriation recommended will be applied to this purpose.

The variation of water surface is about 1 foot, except at times of Brazos River overflows and northers. The maximum draft that can be carried June 30, 1912, over the shoalest part of the locality is 2.8 feet. The length of the channel is 36 miles—21 miles in West Galveston Bay and 15 miles thence to the Brazos River.

No commercial statistics could be obtained for the calendar year 1911. The channel is used by small fishing and vegetable boats, from which no statistics could be obtained.

From records kept by the Gulf, Colorado & Santa Fe Railway Co. of vessels passing through the draw of its bridge across West Galveston Bay during the calender year 1911, 4,903 vessels used the waters of West Galveston Bay.

This work has had no appreciable effect on freight rates.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$10,000

(*b*) *Channel between Brazos River and Matagorda Bay.*—This section of the waterway extends from the Brazos River, at the termination of the Galveston and Brazos River Canal, to 5 feet of water in Matagorda Bay, a distance of 32 miles. The line lies parallel to the coast line of the Gulf of Mexico, distance therefrom half a mile to a mile and a half. The land along the route is generally marshy with numerous shallow bayous, lakes, and ponds, and the elevations along the line do not exceed 5 feet above mean low tide. Of the total length of 32 miles, 24½ miles are overland.

The project as adopted by the river and harbor act of June 25, 1910, contemplates a channel 5 feet deep and 40 feet wide, at a cost of $400,000, with $15,000 annually for maintenance.

Work began on this project May 9, 1911, and to the close of the fiscal year ending June 30, 1912, the amount expended had been $77,880.88, none of which was for maintenance. The work consisted of dredging by contract to form the adopted channel, and by the end of the year 2,200 feet of the channel had been formed, starting at the Brazos River, and 13½ miles completed starting at the Matagorda end.

There is as yet no navigation and no commerce. The project has had no effect on freight rates.

The amount required for expenditure in fiscal year ending June 30, 1914, will be applied to maintaining the improvement.

Report of examination on which the project is based is printed in Rivers and Harbors Committee Document No. 3, Sixty-first Congress, second session.

Of the appropriation of $62,000 made by the river and harbor act approved July 25, 1912, $50,000 will be used for continuing work by dredging under existing contract, and $12,000 for the construction of highway bridges at points where the waterway will intersect existing county roads, as directed by the above-mentioned act.

Amount (estimated) required to be appropriated for completion of existing project	$50,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	25,000

(*c*) *Channel from Aransas Pass to Pass Cavallo.*—This channel was originally developed by the State of Texas and private parties and was the old United States mail route between Indianola and Corpus Christi. In 1875 vessels drawing not over 3 feet could navigate the channel.

The project, as adopted by the river and harbor act of March 2, 1907, contemplates a depth of 5 feet, 40 feet wide, from the entrance at Aransas Pass to Matagorda Bay, a distance of about 63 miles, at a cost of $65,850.

The river and harbor act approved July 25, 1912, contains a provision authorizing the Secretary of War to change the route of the channel from Aransas Pass to Pass Cavallo so as to pass by the town of Port O'Connor, Tex., and to expend available funds for this work, instead of maintaining the channel along its present route.

Amount expended on existing project to close of fiscal year ending June 30, 1912, $72,597.54, of which $23,579.78 was for maintenance.

During the present fiscal year the redredging of the channel has been in progress, 8,000 feet having been gone over, redredging to depth of 5 feet and width of 40 feet, at an expenditure of $13,107.66, all of which was for maintenance.

The maximum draft that can be carried at mean low tide over the shoalest part of the route is 3 feet.

Variation of water surface, about three-fourths of a foot.

Commercial statistics for the calendar year shows a tonnage (in short tons) of 1,497, valued at $38,813. The improvement has had no effect upon freight rates.

Report of examination is printed in House Document No. 336, Fifty-ninth Congress, second session, with map. House Document No. 640, same session, shows a reduction in the estimated cost.

(*d*) *Guadalupe River, bay section.*—This channel connects the mouth of the Guadalupe River with the channel from Aransas Pass to Pass Cavallo. For the first 8 miles there was originally 6 feet of water, shoaling to 4 feet at the twelfth mile, then through a flat with about 2 feet to the mouth of the river at the sixteenth mile.

Variation of water surface, about three-fourths of a foot.

The project contemplated a navigable waterway 5 feet deep and 40 feet wide at a cost of $30,000, and was completed in July, 1909, at a cost of $29,153.82.

During the year the channel was redredged by Government plant for a distance of 35,800 feet.

River section to Victoria, Tex.—The Guadalupe River empties into San Antonio Bay, 16 miles from the inland waterway on the coast of Texas. Its width varies from 90 feet at main entrance at mouth, increasing to 140 feet, 52 miles above its mouth. The depth varies from less than 3 feet over shoals to 20 feet at bends.

Before improvement thick overhanging trees, numerous snags, and sunken logs, together with rafts, were found in the river.

The river was formerly navigated to Victoria, 52 miles from its mouth, but owing to rafts navigation has been abandoned in recent years.

The project contemplates the removal of rafts, snags, etc., and the dredging of shoals to 5 feet, at a cost of $62,700.

During the year snagging and bank trimming has been carried on by Government plant; the river has been cleared for a length of 11¾ miles above its mouth, and from mile 14½ to mile 29⅞.

The amount expended on the work of existing project up to the close of the fiscal year June 30, 1912, including both bay and river sections, is $182,495.60, of which $9,948.32 was for maintenance. All the money called for by the original project ($92,700 and $140,000 additional) has been appropriated. The increased cost of the work is due to an underestimate of the amount of dredging necessary in the river section and to the construction of a combination dredge and snag boat *Guadalupe*, at a cost of $40,000.

The work thus far accomplished has been the widening of the river for a distance of 11¾ miles from its mouth by the removal of thick overhanging trees; the maintenance of the channel from the mouth to the San Antonio River; snagging and bank trimming between miles 14½ and 29⅞, and from the San Antonio River to mile 11¾. Cotton and other freight is shipped from plantations at the lower end, and in the upper end sugar cane and wood have been taken to Victoria. There is no commerce in the middle portion.

The commerce for the calendar year 1911 amounted to 5,694 short tons, valued at $316,310. The project has had no effect on freight rates.

The work of clearing the river of snags and overhanging trees is about 85 per cent completed.

It is intended to apply the amount recommended for expenditure during the fiscal year ending June 30, 1914, toward completing the improvement and resnagging the channel from mile 29¾ to Victoria.

Report of examination and survey is printed in House Document No. 336, Fifty-ninth Congress, second session.

Amount that can be profitably expended in fiscal year, ending June 30, 1914, for works of improvement and for maintenance	$15,000

(*e*) *Turtle Cove Channel between Aransas Pass and Corpus Christi.*—This is a natural depression between Harbor and Mustang Islands connecting at high tide the waters of Aransas and Corpus Christi Bays. It is about 13,500 feet long and 2,000 feet wide, with approximate depth of 1½ feet below mean low tide.

Variation of water surface is about 1 foot.

The project adopted by river and harbor act of March 2, 1907, contemplated a channel 8½ feet deep at mean low tide and 75 feet wide at the bottom, at a cost of $123,750, and was completed in fiscal year 1909 and redredged during fiscal year 1911.

The river and harbor act of June 25, 1910, extended the project to the obtaining of a 12-foot channel between Aransas Pass and Corpus Christi for $157,900, according to report in House Document No. 678, Sixty-first Congress, second session. Report on this new project will be found on page 722 of this report.

Amount expended on existing project to close of fiscal year ending June 30, 1912, was $126,723.57, of which $4,171.43 was for maintenance. No expenditures were made during the past year.

The ruling depth through the channel on June 30, 1912, was 9.9 feet.

The variation of water surface is about 1 foot.

The amount of commerce carried through the channel is the same as that carried through Aransas Pass Channel (see Annual Report of the Chief of Engnieers for 1912, p. 720), 8,880 short tons, valued at $863,000.

For reports of surveys, see House Documents No. 338, Fifty-ninth Congress, second session, and No. 678, Sixty-first Congress, second session.

Consolidated.

Amount (estimated) required to be appropriated for completion of existing project	$88,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	50,000

CYPRESS BAYOU, TEX. AND LA.

Cypress Bayou rises in northeast Texas, flows slightly southeastward approximately 119 miles to Caddo Lake, thence approximately 19 miles across Caddo Lake to Big Willow Pass, thence approximately 24 miles through Willow Pass, Soda Lake, and Twelvemile Bayou, to Red River, just above Shreveport, La., a total distance of about 162 miles. That portion between Jefferson, Tex., and Red River, about 68 miles, is under project in Dallas district.

During the period of the great raft in Red River the bottom lands of Cypress Bayou were flooded—became lakes—and afforded a navigable route from Red River, near Shreveport, La., to Jefferson, Tex., 65 miles. Work by the United States for the improvement of this route commenced in 1872, and from that date to 1879 $94,000 was appropriated for the purpose. The funds were expended for dredging and straightening the channel, removing stumps, snags, and logs, and cutting leaning timber. This work was completed in 1880, but on account of its temporary nature appropriations and allotments aggregating $39,701.33 were made for maintenance.

The removal of the raft and the subsequent closure of outlets and construction of levees down the right bank of Red River from the hills in Arkansas to near Shreveport, La., cut off the water supply of the lakes, which, in conjunction with the quicker drainage resulting from the lowering of the bed of Red River, gradually caused them to dry up. In consequence the period of navigation shortened from year to year until 1897, when boats from Red River ceased plying altogether.

The existing project is practically for maintenance by cleaning and clearing the bayou and lakes between Jefferson, Tex., and Mooringsport, La., of snags and other recurring obstructions.

The amount expended to June 30, 1912, was $156,258.25 for improvement and maintenance and $12,613.05 for surveys. The work of maintenance so merges into the work of improvement that it is difficult to state just what portion of the expenditures was for maintenance and what for improvement.

The water supply of the drainage basin of the lakes has been reduced so greatly and the channel of Red River above Shreveport has lowered so much that steamboats now can cross Albany Flats, at foot of the lakes, only at rare intervals during exceptionally high stages of Red River or after heavy rains in the drainage basin of the lakes.

The work of removing obstructions now in progress has rendered navigation safer between Jefferson and Mooringsport, and has consequently caused some increase in the quantity of such local navigation.

The opening up of oil wells in this territory has caused a considerable increase in the amount of commerce on this waterway. Its existence has been a great convenience in bringing supplies to the oil-well drillers. There has not been sufficient commerce developed between Jefferson, Tex., and Mooringsport, La., to cause any change in the existing freight rates.

The quarter boat in commission on this stream sank during the fiscal year near the site of the proposed dam at the foot of Caddo Lake, and was sold on April 1, 1912, in its sunken condition. A new quarter boat had in the meantime been constructed at Mooringsport, La., and placed in commission. These quarter boats were employed in removing obstructions to navigation between Jefferson, Tex., and Mooringsport, La.

The amount estimated for maintenance of improvement during the fiscal year ending June 30, 1914, is for continuing the work of cleaning the channel of obstructions to navigation.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

OUACHITA AND BLACK RIVERS, ARK. AND LA.

Ouachita (the Indian name for "black") River has its source in Polk County, Ark., in the Ouachita Mountains, and, following an irregular course, flows in a general southeasterly direction through Arkansas and Louisiana until joined by Tensas and Little Rivers at Trinity (Jonesville post office), Catahoula Parish, La. Below this junction it is called Black River, and flows in a southerly direction, entering Red River 34 miles above the mouth of the latter stream. Ouachita River is about 500 miles long and Black River is 56.8 miles long. The section included in the project extends from the mouth of Black River upstream to a point 10 miles above Camden, Ark., 360 miles.

The improvement by the United States commenced in 1871. At that time navigation at all stages was much obstructed by snags, logs, wrecks, leaning and sliding trees, etc., and at low stages the greater part of the river was unnavigable by reason of these obstructions and numerous gravel and sand bars.

The existing project was entered upon in the river and harbor act of June 13, 1902, and is based upon the plan set forth in House Document No. 448, Fifty-seventh Congress, first session (Report of the Chief of Engineers, 1902, p. 1435), and contemplates construction of eight locks and movable dams to afford a navigable depth of 6½ feet from the mouth of Black River, La., upstream to a point 10 miles above Camden, Ark. Besides a continuation of snagging work for maintenance, Congress has authorized the construction of six locks and movable dams, Nos. 2, 3, 4, 6, 7, and 8. The originally proposed site of Lock and Dam No. 2 was changed, eliminating Lock and Dam No. 1 from the project. (See Report of the Chief of Engineers, 1908, p. 490). Construction of Locks and Dams Nos. 5 and 9 has not yet been authorized. The appropriations made for lock and dam construction amount to $2,040,869 and additional continuing-contract authorizations amount to $150,000 for the construction of Locks and Dams Nos. 2, 4, 6, and 8. The first appropriation for Locks and Dams Nos. 3 and 7 was $100,000, the estimated cost being $670,000 for Lock and Dam No. 3 and $634,000 for Lock and Dam No. 7. Continuing-contract provision for the completion of Lock and Dam No. 3, amounting to $620,000, is recommended. The estimated annual cost of snagging work, etc., for maintenance is $25,000.

During the fiscal year ending June 30, 1912, snagging work for maintenance extended from the mouth of Black River, La., to Camden, Ark., 350 miles upstream, with greatly beneficial results.

The condition of the work of lock and dam construction on June 30, 1912, was about as follows:

Per cent completed on basis of material delivered and work done.

	Per cent.		Per cent.
Lock No. 2	11	Dam No. 6	19
Lock No. 4	97	Lock No. 8	96
Dam No. 4	72	Dam No. 8	98
Lock No. 6	85		

Construction of Locks and Dams Nos. 3 and 7, authorized by the river and harbor act approved July 25, 1912, has not commenced.

Lock and dam construction is in progress under continuing-contract appropriations, the balances of the authorizations remaining to be appropriated being as follows: For Locks and Dams Nos. 2, 4, 6, and 8, $150,000.

By authority of the Secretary of War, a tract of land containing 14.96 acres on the left bank of the river in Caldwell Parish, La., was purchased in April, 1912, at $50 per acre, as a part of the site for the construction and maintenance of Lock and Dam No. 3, near Call Landing, La., and 13.74 acres on the right bank of the river are to be purchased, at the same price per acre, as soon as the title thereto is perfected.

Acquisition of 81.8 acres in Union County and 26.45 acres in Bradley County, Ark., as a site for the construction and maintenance of Lock and Dam No. 7, at Perigeethe Shoals, Ark., also has been authorized and it is believed that action in the matter will be concluded and the transfers made in the near future.

The amount expended under the existing project to June 30, 1912, was $1,803,179.72 (including $2,465.13 derived from sales). Of this amount $11,786.73 has been applied to completion of survey, $199,520.80 to maintenance, and $7,994.60 to surveys and acquiring sites for Locks and Dams Nos. 3 and 7.

Besides the slack-water improvement in progress at Locks and Dams Nos. 2, 4, 6, and 8, the work done has consisted chiefly of the removal of snags, logs, wrecks, leaning timber, tree slides, etc., for the purpose of maintaining navigation, and the improvement of Catahoula Shoals, a rock and gravel bar about 20 miles above Trinity, La., where the available depth at low water was increased from 15 to 40 inches. At moderately high stages, or for six to seven months of the year, New Orleans steamboats ascend the river to Camden, Ark.; at medium stages they run to Monroe, La., but during the periods of low water Harrisonburg, La., 72 miles above Red River, is considered the head of navigation, though small local packets make trips between points on the river above. The maximum draft that can be carried at mean low water is 3½ feet to Harrisonburg, La.; 1¼ feet to Monroe, La.; and 8 inches to Camden, Ark. The range between high and low water at the several gauge stations on Ouachita River is as follows: Camden, Ark., 44.2 feet; Monroe, La., 48.6 feet; Riverton, La., 51.3 feet; and Jonesville, La., 54.1 feet. Camden, Ark., is considered the head of navigation, but at high stages the river is navigable in fact to Arkadelphia, Ark.

The commerce of Ouachita River and its tributaries is considerable and consists of shipments of cotton, cotton seed, lumber, staves, saw logs, and miscellaneous articles, with return freights of general merchandise and plantation supplies. Most of the cotton is shipped to New Orleans, and large quantities of staves for export are sent to that city. The volume of commerce as reported for 22 years ranges between 57,684 and 313,863 short tons per annum, with values estimated at $357,220 to $10,234,250. The average is 165,389 short tons, valued at $5,561,044. The variations are due to crop yields, the uncertainty of navigation, droughts, and other causes, and the improvement by locks and dams is for an extension of benefits by affording navigation to Camden the year round.

The project has effected a reduction of railroad rates from New Orleans to Monroe, La., and points below meet the steamboat rates. Railroad rates from Monroe, La., to inland towns, as a rule, are greatly in excess of those to points where there is water competition. The benefits to be derived from slack-water navigation will tend to a greater uniformity and larger volume of commerce.

For more extended information respecting this improvement, reference is invited to the report of 1895 (p. 1887) and to subsequent reports of the district officers.

The available funds will be applied to continuing lock and dam construction, to make the improved depths available, and extend the benefits, and to snagging work, etc., for maintenance. The estimates for the fiscal year 1914 are for the same purpose.

July 1, 1912, balance available	$271,596.99
Amount appopriated by sundry civil act approved Aug. 24, 1912	50,000.00
Amount appropriated by river and harbor act approved July 25, 1912	115,000.00
Amount available for fiscal year ending June 30, 1913	436,596.99
July 1, 1912, amount covered by uncompleted contracts	260,014.97
Amount of continuing contract authorization, act of Feb. 27, 1911	[1] 200,000.00
Amount appropriated under such authorization	50,000.00
Amount yet to be appropriated	150,000.00
Amount (estimated) required to be appropriated for completion of existing project	[2] 1,354,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[2][3] 525,000.00

OUACHITA RIVER ABOVE CAMDEN TO ARKADELPHIA, ARK.

The river and harbor act of March 3, 1871, entered upon a plan for temporary improvement of the river from Arkadelphia, Ark., to Trinity, La. (based upon the report of examination printed in the Report of the Chief of Engineers for 1871, p. 334), but the project was modified in 1874 by discontinuing all work above Camden, Ark.

In 1871 navigation of the stretch of river above Camden to Arkadelphia, estimated distance 90 miles, was obstructed by shoals, snags, logs, leaning timber, etc. There is no record of the amount expended above Camden between 1871 and 1874, as the appropriation was expended for work from Arkadelphia to the Louisiana State line.

In the river and harbor act of August 11, 1888, a project, based upon the plan contained in the Report of the Chief of Engineers for 1887, page 1495, was entered upon for improvement of the river above Camden to Arkadelphia by cutting leaning timber, removing snags and logs, and building brush dams at the shoals. This work was completed in 1890, the sum of $9,000 having been expended for that purpose.

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[1] For Locks and Dams Nos. 2, 4, 6, and 8.

[2] Exclusive of amount available for fiscal year 1913 for Locks and Dams Nos. 2, 3, 4, 6, 7, and 8.

[3] For Locks and Dams Nos. 2, 4, 6, and 8, $150,000, under continuing contract authorization made by the river and harbor act of 1911; for Locks and Dams Nos. 3 and 7, $350,000; for open-channel work, $25,000; total, $525,000.

The existing project, which has not been modified since its adoption in the river and harbor act approved June 25, 1910, contemplated the removal of snags, leaning timber, etc., which had accumulated since 1890 and which rendered navigation difficult during the period between December and May, when there generally is sufficient water. (H. Doc. No. 588, 62d Cong., 2d sess., with maps.)

This work was completed during the fiscal year ending June 30, 1912, the amount expended having been $17,389.81. During the fiscal year 1911 operations were carried downstream from Arkadelphia to the mouth of Little Missouri River, about 57 miles, and from Camden upstream 4 miles. Operations during the fiscal year 1912 covered the intervening stretch.

The commerce of this section of the river consists chiefly of floating saw logs to mills downstream. Other commerce is small and has declined in recent years. The work performed has had no effect on freight rates.

It is recommended that maintenance of the work be continued, at a cost of $2,500 per year for three years, or until it is evident that the amount of commerce does not warrant further maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$2,500

ARKANSAS RIVER, ARK.

Arkansas River has its source in the Tennessee Pass, in central Colorado, whence it flows in a generally southeasterly direction to the Mississippi River, into which it empties near the southeastern corner of the State of Arkansas. It has a total length of about 1,460 miles, of which 350 are in Colorado, 400 in Kansas, 340 in Oklahoma, and 370 in Arkansas. The general project for the improvement covers the navigable portion extending from the mouth of the river to the mouth of Neosho (Grand) River, 461 miles.

In its original condition the channel of the river was greatly obstructed by shifting sand bars and numerous snags in its lower reaches, and by gravel and rock shoals and some snags in its upper reaches. Navigation was difficult and uncertain at medium and low stages, and during periods of extreme low water was impossible.

General projects.—Prior to act of Congress approved June 13, 1902, the work on this river was carried on under two general projects—one entitled "Removing obstructions in Arkansas River, Ark. and Kans.," the other "Improving Arkansas River, Ark."

Act of Congress approved June 13, 1902, merged those two general projects into one, which makes the existing general project in substance: "The improvement of the river from its mouth to the head of navigation by snagging operations, by dredging operations, and by contraction works, holding the improved channel by revetment where necessary." No definite estimate of cost can be given.

Dredging project.—By act of June 25, 1910, Congress adopted a definite dredging project based on reports printed in House Documents No. 71, Sixty-first Congress, first session, and No. 510, Sixty-first Congress, second session. The contemplated work is that of procuring and operating two suction dredges between the mouth of the river and Ozark, 318 miles, at an estimated cost of $349,000 for plant and $118,000 annually for its operation, the object being to aid and encourage navigation.

Originally this work was reported under a separate heading. By act of February 27, 1911, it was consolidated with the other projects under the general heading "Improving Arkansas River."

The act of June 25, 1910, authorized under this appropriation title maintenance of the works at Pine Bluff, Ark. Therefore, by combining the dredging project of June 25, 1910, and the general project of June 13, 1902—a combination effected by act of February 27, 1911—and this authorization, the existing project now is:

> The improvement of the river from its mouth to Ozark (318 miles) by operating two suction dredges; from its mouth to the head of navigation by snagging operations, by dredging operations, and by contraction works, holding the improved channel by revetment where necessary; and maintenance of the works at Pine Bluff, Ark. No estimate for completion can be given.

The operations of this fiscal year were for maintenance of channel by snagging operations, for maintenance of works at Pine Bluff, and making contracts for the construction and delivery of two dredges. The expenditures were $29,368.39 for maintenance of channel, $2,431.70 for maintenance of works at Pine Bluff, and $315.86 toward procurement of two suction dredges. The snag boats *C. B. Reese* and *Arkansas* operated between the mouth of the river and Shoal Creek (281 miles) removing 1,500 snags, cutting 14,459 trees, and breaking up 3 drifts. At Pine Bluff, Ark., repair of flood damages to the revetment was begun. A contract has been made for the construction and delivery of two suction dredges.

To June 30, 1912, there had been expended on the existing project $323,937.79, of which $253,857.18 was for operating snag boats, $43,866.89 for operations of a hydraulic dredge prior to the 1910 dredging project, $20,470 for maintaining works for permanent improvement built prior to 1902, $5,284.26 for maintaining works at Pine Bluff, and $459.46 toward procurement of two suction dredges. Of these funds $114.57 were derived from sales.

To June 30, 1912, the total expenditures on all projects under this head have been $2,573,022.99, distributed as follows:

Operating snag boats	$1,285,511.31
Hydraulic dredging (prior to 1910)	43,866.89
Construction of works for permanent improvement	903,311.93
Maintenance of those works	334,589.14
Maintenance of works at Pine Bluff, Ark	5,284.26
Procuring suction dredges (1910 project)	459.46
Total	2,573,022.99

Fort Gibson, on Neosho (Grand) River, 2 miles above its mouth and 463 miles from the mouth of the Arkansas River, is the present head of steamboat navigation. The duration of the navigable periods of the river varies greatly in different years. Occasionally there are periods of very low water, when navigation will be suspended throughout the length of river, and then there will be times when it is possible to maintain 3-foot navigation through to Fort Gibson all the year. Generally the maximum draft that can be carried at ordinary low water is 3 feet from the mouth of the river to Pendleton (42), 2 feet from Pendleton (42) to Swan Lake (80), 1½ feet from Swan Lake (80) to Webbers Falls (430), and 1 foot from Webbers Falls (430) to mouth of Neosho (Grand) River

(461). The periods of navigation by steamboats are of about the following averages:

	Months a year for 4-foot draft.	Months a year for 2-foot draft.
Mouth to Swan Lake (80 miles)	5½	10
Mouth to Little Rock (174 miles)	5	9½
Mouth to Neosho (Grand) River (461 miles)	4	8

The range between extreme high water and extreme low water at Fort Smith, Ark., is 35.5 feet; at Little Rock, Ark., 30 feet; and at the mouth of the river, where the stages are controlled by those of the Mississippi, the extreme range is 54 feet.

The long period of extremely low water mentioned in last annual report ended July 25, 1911, since which date there have been six and one-half months of good stages for navigation above Pine Bluff (107 miles up the river) and eight months below there.

Commercial statistics.

Year.	Short tons.	Value.	Year.	Short tons.	Value.
1894 (ending May 31)	63,563	$2,846,395	1904 (ending May 31)	92,041	$2,078,893
1895 (ending May 31)	50,498	2,380,420	1905 (ending May 31)	86,458	1,636,930
1896 (ending May 31)	54,261	2,408,720	1906 (ending May 31)	108,214	1,512,719
1897 (ending May 31)	66,077	1,657,218	1907 (ending May 31)	104,593	2,192,531
1898 (ending May 31)	58,578	1,626,756	1908 (ending May 31)	103,919	2,150,269
1899 (ending May 31)	68,057	2,470,131	1909 (ending May 31)	92,455	2,122,105
1900 (ending May 31)	75,654	2,078,940	1910 (ending May 31)	62,172	1,630,338
1901 (ending May 31)	71,998	2,623,797	1910 (calendar year)	59,516	1,612,288
1902 (ending May 31)	40,557	1,630,297	1911 (calendar year)	81,371	1,085,018
1903 (ending May 31)	86,068	2,389,020			

Plantation products and supplies made up 12 per cent and forest products 85 per cent of the commerce for the calendar year 1911, the remaining 3 per cent being unclassified freights. Forty per cent of the total for that year was rafted saw logs.

It does not appear that the improvement of the river in late years has had any marked effect on intrastate freight rates, either by water or by rail. In 1900 and 1901 the improvement of the river reached its highest state of development. Since that time the permanent works have been permitted to deteriorate, and the snag boats working alone have not been able to extend the development any. The intrastate rail rates are controlled by a State railway commission and are based on a "standard distance tariff," and the river is not taken into consideration in making this tariff. This statement applies to all the rivers in the State of Arkansas.

The balance available July 1, 1912, will be expended in snagging operations, in maintenance of works at Pine Bluff, and in procuring dredging plant. The amount estimated for the fiscal year ending June 30, 1914, is for snagging operations and maintenance of works at Pine Bluff. The estimate is based on the assumption that appropriations will be made annually hereafter.

July 1, 1912, amount covered by uncompleted contracts	$295,514
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	48,000

CACHE RIVER, ARK.

Cache River, Ark., has its source in the flatlands of Clay County, Ark., whence it flows about 300 miles in a south-southwesterly course to the White River at Clarendon, Ark. Operations under the present project extend from the mouth of the river to Gregory Bridge, 86 miles.

In its original condition this river was much obstructed by snags, drift, and overhanging timber. The low-water depth on the controlling shoals was 6 to 8 inches.

The original project, adopted by the act of August 11, 1888, was to remove logs, snags, and overhanging timber from the mouth to Riverside (102 miles). The amount expended on this project was $9,000.

The river and harbor acts of August 18, 1894, and June 3, 1896, each authorized the Secretary of War to expend $2,000 of the White River appropriations on this stream. The river and harbor act of March 3, 1899, revived this as an independent work thus: "Improving Cache River, Arkansas: To be expended in removing obstructions, one thousand dollars." No definite statement as to length of river to be improved was stated. The funds obtained from those three acts and subsequent ones have been expended in maintenance of channel by snagging operations, first below James Ferry, 79 miles above the mouth, and later extended to Gregory Bridge, 86 miles above the mouth.

The existing project is one for maintenance of channel by snagging operations, no definite limits for the work and no estimate for completion being given.

The operations during the past fiscal year were for maintenance of channel below Gregory Bridge, 86 miles, by snagging operations. A chopping party, with a small scow fitted with a winch for raising logs, worked over this part of the river, removing 2,231 snags, cutting 705 trees, breaking 33 drifts, and girdling 480 trees. These operations left the channel through "the lakes" between James Ferry and Gregory Bridge in better condition than ever before. Below James Ferry they maintained the good condition existing at the close of the fiscal year ending June 30, 1911.

To June 30, 1912, there has been expended $19,555.97 on maintenance of channel. The total expenditures to that date under all projects were $28,555.97, of which $100.30 were derived from sales.

The operations have been of material benefit to commerce in lengthening the navigable periods by rendering the natural depths of the stream available for navigation purposes.

Grays Bridge, 95 miles above the mouth of the river, is considered the head of steamboat navigation, but the river is not navigable to that point all the year, the ruling depth in the channels over the shoals throughout the river being only 8 to 10 inches during lowest water. During high-water seasons rafts are run from 100 or more miles above Grays Bridge. In the vicinity of James Ferry (79 miles above the mouth of the river) the range between high and low water is about 15 feet. Because of backwater from White River this range is increased to 24 feet at Rock Island Railway Bridge and to 32 feet at the mouth of the river.

Commercial statistics.

Years.	Short tons.	Value.	Years.	Short tons.	Value.
1895 (ending May 31)	12,608	$25,494	1904 (ending May 31)	15,865	$49,605
1896 (ending May 31)	20,748	62,483	1905 (ending May 31)	11,660	29,864
1897 (ending May 31)	34,990	108,460	1906 (ending May 31)	10,942	31,777
1898 (ending May 31)	16,193	36,635	1907 (ending May 31)	13,050	39,225
1899 (ending May 31)	7,667	52,936	1908 (ending May 31)	21,173	59,254
1900 (ending May 31)	11,215	29,961	1909 (ending May 31)	9,420	36,153
1901 (ending May 31)	10,374	30,100	1910 (ending May 31)	23,426	72,071
1902 (ending May 31)	15,676	40,301	1910 (calendar year)	33,134	98,782
1903 (ending May 31)	16,843	109,681	1911 (calendar year)	40,308	82,316

The commerce reported during the year was made up entirely of saw logs and rough lumber. Ninety-four per cent of the total was rafted logs.

The balance available July 1, 1912, and the additional appropriation recommended will be expended in snagging operations for maintenance of channel. The additional appropriation recommended is based on the assumption that appropriations will be made annually hereafter.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement $2,000

ST. FRANCIS AND L'ANGUILLE RIVERS AND BLACKFISH BAYOU, ARK.

(*a*) *St. Francis River.*—St. Francis River has its source in the Ozark Mountains in St. François County, Mo., whence it flows in a southerly direction 490 miles to the Mississippi River, 8 miles above Helena, Ark. From its source to Wappapello, Mo., 120 miles, the river is a mountainous stream. At Wappapello it leaves the St. Francis Mountains, spurs of the Ozarks, and enters the alluvial basin of the Mississippi River. That portion of the river included in this project extends from its mouth to Kennett, Mo., 260 miles, the upper 80 miles of which are through the Sunken Lands of the St. Francis.

In its original condition this stream was not navigable above Lesters Landing at any stage; between Lesters Landing and Marked Tree navigation was possible at high stages only, and below Marked Tree it was difficult at medium and low stages and impossible at extreme low water.

The original project, adopted by act of March 3, 1871, contemplated improvement from the mouth to Wittsburg by snagging operations. For the period 1873–1882 the appropriations were made for this work in connection with White River, Ark. By act of June 14, 1880, appropriation was made for improving the river from Wittsburg to Lesters Landing, the project for the expenditure of this appropriation being to cut a channel through "The Lake" and clear the river of obstructions by snagging operations. Appropriation made by act of July 5, 1884, was the first separate appropriation for the entire river. The act did not state the limits within which it was to be applied. Under it snagging operations were carried on to the town of St. Francis, Ark., and several of the sloughs or side channels were closed. When the improvement of St. Francis River, Mo., was begun (act of

Aug. 11, 1888), Kennett, Mo., was taken for the upper limit of this work, making the existing project—

> removal of logs, drifts, and snags from the channel, and overhanging timber from the banks from the mouth to Kennett, Mo., and closing the chutes and sloughs in the Sunk Lands, so as to make the river navigable at high stages to Kennett, Mo., at medium stages to Marked Tree, and at low stages to a point 30 miles below Madison, Ark., the estimated cost being $8,000 annually.

(*b*) *L'Anguille River.*—L'Anguille River has its source in the flat lands of Poinsett and Craighead Counties, Ark., whence it flows in a southerly direction to St. Francis River, emptying into that stream 12 miles above its mouth. The portion of the river included in this project extends from St. Francis River up to the town of Marianna, Ark., 8 miles. The navigable stages, like those of the lower St. Francis River, are controlled by the stages of the Mississippi River, back water from which gives navigable stages to Marianna when the Helena gauge reads 12 feet or more. During periods of low water the channel width over the shoals is only 10 to 20 feet. At bank-full stages the river width varies from 300 to 550 feet.

By acts of June 18, 1878, March 3, 1879, and June 14, 1880, a total of $17,000 was appropriated for snagging operations on L'Anguille River to Marianna. This was finally expended in fiscal year ending June 30, 1887. Act of June 13, 1902, revived this work and included it with St. Francis River. Therefore the existing project is to improve the river from its mouth to Marianna, 8 miles, by snagging operations, no estimate for completion or annual estimate for maintenance being stated.

(*c*) *Blackfish Bayou, Ark.*—Blackfish Bayou is one of the principal drainage channels for the lower portion of the St. Francis Basin. Its headwaters are in the west central portion of Crittenden County, from where it flows in a southwesterly direction through the eastern portion of St. Francis County to near the south line of that county, where it empties into St. Francis River, 44 miles above the mouth of that stream. From the St. Francis River up to the mouth of Fifteenmile Bayou—about 6 miles—Blackfish Bayou has a low-water width of 125 to 150 feet, a width of 250 to 300 feet when at bank-full stage, a low-water depth over the controlling shoals slightly greater than that over the shoals in St. Francis River, neither stream being navigable by boats of commerce during low-water periods. The navigable stages of Blackfish Bayou up to the mouth of Fifteenmile Bayou, like those of the lower St. Francis River, are controlled by the stages of the Mississippi River, and backwater from the Mississippi River gives a navigable stage in Blackfish Bayou up to Fifteenmile Bayou when the Helena gauge reads 17 feet and above.

The existing project, adopted by the river and harbor act of June 25, 1910, in accordance with report printed in House Document No. 73, Sixty-first Congress, first session, provides for the removal of snags and overhanging timber obstructing the channel in connection with similar work now being done on the St. Francis River, at an estimated cost of $500 annually, and the said act provides that of the consolidated appropriation made, not exceeding that sum may be expended, in the discretion of the Secretary of War, for the purpose stated.

The existing project is to remove snags and similar obstruction in St. Francis River from its mouth to Kennett, Mo.; in L'Anguille

River from its mouth to Marianna, and in Blackfish Bayou from its mouth to Fifteenmile Bayou; also to close chutes and sloughs in the Sunken Lands on the St. Francis.

To June 30, 1912, there had been expended $141,829.89 on these streams, of which $4.19 was derived from receipts from sales. This, however, does not include the expenditures on St. Francis River while it was combined with White River, as those expenditures can not be determined from the information now available.

By the early operations the St. Francis River between Wittsburg and Lesters Landing was improved to such an extent that boats could reach the latter-named place on the same stage as they could the former. By subsequent operations the period of navigation below Wittsburg was lengthened about two months, and above Lesters Landing a fair high-water channel was made. The improvements thus made below Wittsburg have been maintained. No effort is being made to maintain those above Marked Tree, the commerce on that portion of the river not warranting any expenditures at this time.

During periods of low water neither stream is navigable, there not being sufficient depth of water over the shoals. Marianna is the head of navigation on L'Anguille River. The head of navigation on St. Francis River is near Wappapello, Mo., about 100 miles above Kennett, Mo., the upper limit of the portion of the river covered by this project. Lying between Kennett, Mo., and Foot of Lake, 80 miles below, are the Sunken Lands of the St. Francis, one vast swamp, through which the river flows in several channels, none of which is well defined and all of which are more or less obstructed and frequently blocked. Lesters Landing is 34 miles above Foot of Lake and is the practicable head of navigation on the St. Francis River in Arkansas. Boats can pass between it and Kennett, Mo., only during high stages, and then only with great difficulty.

Under ordinary conditions when the levees along the Mississippi River front of the St. Francis Basin are intact the range between high and low water of the St. Francis River at Lesters Landing is about 3 feet. This increases to 19.8 feet at Marked Tree, which is the maximum that would exist at any point below there were it not for the backwater from the Mississippi River, but on account of that backwater the range at Madison is 36 feet. At the mouth of the river the oscillation is 56 feet. When crevasses in the levees along the St. Francis front occurred in the spring of 1912, the oscillation at Marked Tree was 24.2 feet and at Madison 42 feet.

Commercial statistics.

Years.	Short tons.	Value.	Years.	Short tons.	Value.
1894 (ending May 31)	19,763	$98,375	1904 (ending May 31)	119,172	$423,469
1895 (ending May 31)	38,107	321,439	1905 (ending May 31)	142,098	590,560
1896 (ending May 31)	67,740	401,457	1906 (ending May 31)	137,319	472,257
1897 (ending May 31)	97,348	1,117,891	1907 (ending May 31)	151,015	833,397
1898 (ending May 31)	23,819	237,481	1908 (ending May 31)	286,820	1,376,757
1899 (ending May 31)	27,892	315,459	1909 (ending May 31)	160,057	1,148,855
1900 (ending May 31)	45,065	194,237	1910 (ending May 31)	180,270	679,662
1901 (ending May 31)	57,102	272,609	1910 (calendar year)	247.945	1,643,535
1902 (ending May 31)	85,831	269,190	1911 (calendar year)	298,470	1,443,778
1903 (ending May 31)	88,035	294,495			

Forest products—45 per cent of which were rafted saw logs—made up 91 per cent of the total commerce reported for the year. The remaining 9 per cent was made up of plantation products and supplies, mussel shells, and general freights. There is no separation of the commerce carried over the three rivers. That arising or terminating on Blackfish Bayou passes over portions of St. Francis River, as does most of that terminating on L'Anguille River.

The balance available July 1, 1912, will be expended in snagging operations in St. Francis River. The amount estimated as being needed for the fiscal year ending June 30, 1914, is for maintenance of channels in the three rivers by snagging operations—$500 in Blackfish Bayou—the remainder in St. Francis and L'Anguille Rivers. The estimate is based on the assumption that appropriations will be made annually hereafter.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$7,000

SALINE RIVER, ARK.

Saline River has its source in Saline County, Ark., about 30 miles west of Little Rock, flows in a general southerly direction, and enters Ouachita River 96 miles below Camden. It is about 300 miles long. The section included in the project, from the mouth upstream to Turtle Bar, is about 135 miles.

The original condition of this stream before its improvement was undertaken by the United States was such that boats of 100 tons burden could navigate to Godfrey Landing, 10 miles above the mouth, at ordinary low water; to Longview, 38 miles above the mouth, during medium stages; and to Mount Elba, 104 miles above the mouth, at high stages. There was navigation for flatboats between Hurricane Creek and the mouth, 138 miles, during the spring freshets or for about two months of each year. During the periods of low water the stream was unnavigable, the depths in the lower reaches ranging from 1.5 to 2 feet for a boat 12 feet wide, and in the upper reaches being only 6 inches for a boat 8 feet wide. The obstructions during the navigable periods were snags, drift piles, and overhanging timber.

The original project (act of June 14, 1880) contemplated snagging operations for the removal of obstructions between the mouth and Turtle Bar. The amount expended under this project was $21,500. Operations were suspended in December, 1884. This project was based upon a report of examination (without maps) in Report of the Chief of Engineers for 1879, page 1003.

The existing project (act of June 25, 1910, H. Doc. No. 1212, 60th Cong., 2d sess., no maps) is a revival of the old project and contemplates snagging operations for the removal of obstructions which have formed between the mouth and Turtle Bar. The estimated cost was $5,400, with annual charges of $3,000 for maintenance.

The amount expended under the existing project to June 30, 1912, was $5,691.67. The work was transferred from the Little Rock, Ark., to the Vicksburg, Miss., district in July, 1910, and the district officer was authorized to defer operations until a suitable snagging outfit could be spared from the work of improving Ouachita River. In the spring of 1911 preparations were made for beginning work, and a light-draft quarter boat fitted out for the purpose was cordelled upstream to the St. Louis, Iron Mountain & Southern Railway bridge near Warren, Ark., about 58 miles above the mouth of the river, where active operations commenced June 20. During the fiscal year 1912 work was carried downstream to a point about 12 miles above the mouth. This work was heavy and the available funds were exhausted in November, 1911.

In January, 1912, complaints were made by navigation interests of obstructions caused by jams of drift, and by authority of the Secretary of War the sum of $500 was allotted March 6, 1912, from the appropriation provided by the river and harbor act of March 3, 1905, for emergency work. The obstructions complained of consisted of one jam and four side jams between 5 and 6 miles above the mouth, which were removed by a snag boat in March, 1912, at a cost of $291.67. The balance of the allotment, $208.33, was returned to the Treasury to the credit of the appropriation.

Rafting and logging are carried on in this stream from points above Mourning Ferry, 145 miles, and barges may be floated in this stretch during periods of high water. The commerce reported in 1911 amounted to 2,000 short tons of saw logs, valued at $6,000. The project has had no effect on freight rates. Mount Elba, 104 miles above the mouth, is considered the head of steamboat navigation at high water, although boats have made occasional trips years ago to Hurricane Creek, 138 miles above the mouth. Godfrey Landing, 10 miles above the mouth, is the head of steamboat navigation at ordinary low water. The range between high and low water is about 28 feet throughout that part of the river in which work is contemplated.

The available funds will be applied to snagging work, etc., in accordance with the existing project. The estimate for maintenance is for continuing the work and for the removal of obstructions added from time to time.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$3,000

WHITE RIVER, ARK.

The White River has its source in the Boston Mountains, in the extreme northern portion of Franklin County, Ark., whence it flows in a northerly direction into the State of Missouri, thence to the east and to the southeast, returning to Arkansas in Boone and Marion Counties, 230 miles from its source. From the north line of Marion County, Ark., it flows in a southeasterly direction 200 miles, to Newport, Ark., thence in a southerly direction 260 miles, to a junction with the Arkansas River, 8 miles upstream from a point where the latter debouches into the Mississippi. The total length of the river is 690 miles. Its navigable portion extends from its mouth to Forsyth, Mo., 505 miles. The length of river covered by this project is 301 miles, extending from the Mississippi River to Batesville, Ark.

In its original condition this river was much choked by logs, snags, and drift in its lower reaches, and in its upper reaches—i. e., above Jacksonport—by gravel shoals, bowlders, and some snags.

The original project (act of Mar. 3, 1871) was to remove snags and similar obstructions, the work being combined with similar work on Black and Little Red Rivers. Act of June 23, 1874, extended the improvement to Forsyth, Mo., the project being to remove snags and bowlders, and to contract the water width at shoals. During the period 1873–1884 the snagging operations on the lower river were in connection with similar work on St. Francis River, while the improvement above Jacksonport was under appropriations confined to that portion of the stream. The act of July 5, 1884, was the first independent appropriation for the river as a whole. It readopted and consolidated into one the separate projects, and provided for a survey with a view to the permanent improvement of the river from Forsyth, Mo., to the mouth. The project of 1888 was to deepen the water on shoals by contracting the channel, and to remove rocks, bowlders, and snags from the channel, the object being to obtain a channel 5 feet deep at low water from the mouth to Newport and 2 feet deep thence to Buffalo Shoals, at an estimated cost of $105,815, with an additional amount of $8,000 a year for two or three years for snagging. For reasons given in the Annual Report of the Chief of Engineers for 1891, page 2049, the estimates were inadequate to accomplish the object. The act of July 13, 1892, appropriated $53,815 to complete the project, and an additional sum of $21,185 to be expended "in the discretion of the Secretary of War." These funds and those appropriated since have been expended on the lines of the project of 1888, with the addition of dredging on the shoals. The act of March 3, 1899, adopted a lock-and-dam project for the improvement of this river above Batesville, thus reducing the scope of the former project to improving the river from the mouth to Batesville by contracting the channel, by removing rocks, bowlders, and snags, and by dredging.

It is not practicable to state the expenditures on this river when the work was carried on in connection with other rivers. On the projects prior to March 3, 1899, there were expended from the separate appropriations for the whole river or its reaches, $362,801.57.

The existing project is for improving the river from the mouth to Batesville by contracting the channel; by removing rocks, bowlders, and snags, and by dredging.

To June 30, 1912, there has been expended $134,756.11 in maintenance of channel below Batesville, Ark., $71.68 of which was derived from sales, etc. The total expenditures on the river for open-channel work from the first separate appropriation to June 30, 1912, are $497,557.68.

The contraction works built above Jacksonport under the earlier projects gave some increase in channel depth and the dredging between Jacksonport and Batesville in the fiscal year 1898 made a channel 3 feet deep during one low-water season, but the dredging has not been continued, no plant being available. The snagging operations make the natural depths of the stream available during the low-water season in which the work is done. The winter and spring floods following bring other obstructions into the stream, hence snagging operations are needed every year.

Forsyth, Mo. (505 miles above the mouth), is the head of steamboat navigation. From its mouth to Jacksonport, 264 miles, the river is generally spoken of as being navigable at any time for boats of not over 3-foot draft. Between Jacksonport and Batesville, where Lock No. 1 of the upper White River improvement is located, the low-water channel depths are approximately 16 inches.

The range between extreme high water and extreme low water below Dam No. 1 at Batesville is 35.5 feet; at Jacksonport, 34.4 feet; at Clarendon, 32.5 feet; and at the mouth of the river, 54 feet.

Commercial statistics.

Years.	Short tons.	Value.	Years.	Short tons.	Value.
1895 (ending May 31)........	73,759	$2,494,377	1904 (ending May 31)........	193,498	$1,021,778
1896 (ending May 31)........	74,882	2,056,991	1905 (ending May 31)........	134,588	770,689
1897 (ending May 31)........	73,962	2,435,814	1906 (ending May 31)........	100,083	766,138
1898 (ending May 31)........	102,337	1,415,013	1907 (ending May 31)........	127,812	830,659
1899 (ending May 31)........	117,891	1,619,351	1908 (ending May 31)........	161,246	962,508
1900 (ending May 31)........	134,696	2,244,222	1909 (ending May 31)........	134,200	671,230
1901 (ending May 31)........	148,574	1,700,355	1910 (ending May 31)........	141,771	619,718
1902 (ending May 31)........	184,066	1,242,438	1910 (calendar year).........	118,496	863,022
1903 (ending May 31)........	140,013	882,225	1911 (calendar year).........	143,285	1,448,401

Forest products made up 90 per cent of the commerce reported for the calendar year 1911, agricultural products and farm supplies formed only 7 per cent, and the remaining 3 per cent was made up of mussel shells and unclassified freights.

The balance available July 1, 1912, will be expended in maintenance of channel by snagging operations. The amount estimated as being needed for the fiscal year ending June 30, 1914, is for snagging operations over the entire river below Batesville and for dredging operations between Batesville and the mouth of Black River. It is based on the assumption that appropriations will be made annually hereafter.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement________________________	$20,000

BLACK AND CURRENT RIVERS, ARK. AND MO.

Prior to the fiscal year 1905 the work on these rivers was provided for under separate appropriation titles. The works were consolidated by river and harbor act of March 3, 1905.

(*a*) *Black River*.—Black River has its source in the Ozark Mountains in the northwest corner of Reynolds County, Mo., whence it flows first in a southeastely direction to the south line of the State of Missouri, then in a southwesterly direction to White River at Jacksonport, Ark. Its total length is about 360 miles, of which the lower 235 miles from its mouth to Poplar Bluff, Mo., is covered by project for improvement.

In its original condition this river below the mouth of Current River had, at ordinary low water, a controlling depth of 2 to 2½ feet on the shoals, but this was not available on account of snags and similar obstructions. Above the mouth of Current River navigation was practically impossible at ordinary low stages, and no rafting was possible above the Arkansas and Missouri State line.

The original project, adopted by act of June 14, 1880, contemplated removing logs, etc., cutting down shoals by means of wing dams, and closing some of the most troublesome sloughs. The estimated cost was $80,800. The only modification of the project has been that of changing the estimate for maintenance. While dredging is not specifically mentioned in the project, it is necessary as a means of maintenance and has been so authorized.

To June 30, 1912, there had been expended on this work $195,327.39, of which $28.86 were derived from receipts from sales, etc.

Poplar Bluff, Mo., 239 miles above the mouth of the river, is the head of navigation. All-the-year navigation has been made possible to this place for boats of not over 18 inches draft. Boats of not over 2½ feet draft can navigate this river below the mouth of Current River, 116 miles, during the lowest waters, and this portion of the river is generally spoken of as being navigable for 3-foot boats at any time.

The range between high and low water at Poplar Bluff is 19 feet. This difference decreases below Poplar Bluff, and in the flat lands to the southward it averages about half of this, being 8.5 feet at Corning Bridge, 70 miles below Poplar Bluff. After passing to below head of Little River the difference between high and low water increases, and at Pocahontas, 129 miles below Poplar Bluff, the difference is 26.5 feet, and at the mouth of the river it is 34.4 feet.

(*b*) *Current River.*—Current River has its source in the Ozark Mountains in Texas County, Mo. It first flows in a northeasterly direction, then in a southeasterly direction to the south line of Missouri, then in a southwesterly direction to Black River in Randolph County, Ark. Its total length is about 200 miles, of which the lower 94 miles, from its mouth to Van Buren, Mo., are under project for improvement.

The original condition of this stream was such that no steamboat navigation above the mouth of Little Black River was attempted except when the river was at high stages. Below Little Black River navigation was suspended when the river was below medium stage. The natural depths were not available on account of snags and leaning trees.

Although the United States made some improvements to this stream in 1873, and again in 1882 and 1883, the regular improvement of it was not undertaken until act of Congress of August 18, 1894, adopted a project for its improvement from Van Buren, Mo., to the mouth by snagging operations and by contracting the channel at the worst shoals by wing dams, at an estimated cost of $10,000. The appropriation of June 3, 1896, completed the amount originally estimated for the completion of the project, and all operations since then have been under estimates for maintenance. No wing dams have been built, all operations having been confined to snagging.

The existing project is the improvement of the river from Van Buren, Mo., to the mouth by snagging operations and by contracting the channel at the worst shoals by wing dams.

To June 30, 1912, there has been expended on this project $48,650.29, of which $38,650.29 was for maintenance. Of this $15 was derived from sales, etc. The total expenditures under all projects to June 30, 1912, was $55,650.29.

Van Buren, Mo., 94.5 miles above the mouth of the river, was taken as the head of navigation when the earlier projects for this river were adopted. Small gasoline boats occasionally ply the river that far up, and rafts are run over the entire river, but Pitmans Landing, near the State line between Arkansas and Missouri and 41 miles above the mouth of the river, is generally spoken of as the head of steamboat navigation. Boats can not reach that point, however, during low-water seasons, the low-water depths of the river being as follows: Three feet from the mouth of Blunts (Johnsons Landing), 25 miles; 2 feet from Blunts to mouth of Little Black River, 7 miles; and 16 inches from mouth of Little Black River to Pitmans Landing, 9 miles. From Pitmans Landing to Doniphan, 12 miles, the head of the work done by snag boats now, the low-water depths are about 12 inches.

The range between high and low water at Van Buren is about 16 feet, and this range does not vary much until below the mouth of Little Black River, when the range increases to 19 feet.

Commercial statistics.

Years.	Black River.		Current River.	
	Value.	Short tons.	Value.	Short tons.
1895 (year ending May 31)	$1,085,415	132,433	$362,447	31,206
1896 (year ending May 31)	891,437	111,278	227,291	29,867
1897 (year ending May 31)	1,704,799	111,611	581,528	17,078
1898 (year ending May 31)	788,640	115.612	306,216	52,417
1899 (year ending May 31)	529,336	83,404	239,869	43,050
1900 (year ending May 31)	966,961	129,698	578,834	65,043
1901 (year ending May 31)	989,635	185,714	234,555	64,102
1902 (year ending May 31)	919,767	166,213	165,766	37,185
1903 (year ending May 31)	695,649	138,181	142,899	45,309
1904 (year ending May 31)	1,092,648	191,285	139,119	55,573
1905 (year ending May 31)	1,004,299	144,065	409,297	74,048
1906 (year ending May 31)	625,985	189,384	152,216	47,704
1907 (year ending May 31)	692,968	107,914	226,655	48,486
1908 (year ending May 31)	517,905	140,826	115,826	27,696
1909 (year ending May 31)	439,355	86,070	36,802	10,735
1910 (year ending May 31)	471,219	75,677	124.001	25,082
1910 (calendar year)	348,042	74,082	121,801	22,557
1911 (calendar year)	298,271	95,635	67,611	24,014

Logging and kindred industries furnished the bulk of the commerce, and of that reported for the year 59 per cent on Black River and 38 per cent on Current River was rafted saw logs.

The balance available July 1, 1912, will be expended in snagging operations for maintenance of channel and maintenance of plant. The amount estimated for the fiscal year ending June 30, 1914, is for maintenance of channel in Current River by snagging operations and in Black River by snagging and dredging operations. The estimate is based on the assumption that appropriations will be made annually hereafter.

Consolidated.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$25,000

CUMBERLAND RIVER, KY. AND TENN., ABOVE NASHVILLE, TENN.

This section extends from Nashville to the mouth of Rockcastle River. In its original condition it was considerably obstructed by rock reefs, ledges, snags, etc., which greatly impeded navigation between Nashville and Burnside (about 325 miles), while above Burnside the Smith Shoals formed a serious obstruction to navigation at practically all stages. The general direction of flow of this section is southwest.

The length of the section included in the present project of canalization is about 160 miles. The distance of the lower end of the project from the mouth of the river is about 190 miles.

The original scheme of improvement above Nashville, as modified and extended, contemplated open-channel work from Nashville, Tenn., to Cumberland Ford (Pineville, Ky.), 497 miles, at an estimated cost of $374,764, and was based on projects submitted January 20, 1871, and February 8, 1872.

The first appropriation specifically applicable to the Cumberland River above Nashville was made by the act of August 14, 1876.

This open-channel scheme of improvement, or old project, resulted in giving increased depths at several of the principal obstructions, thus securing a longer and safer period of navigation. Under this project and its modifications appropriations aggregating $346,000 were made and expended.

The project for the canalization of the Cumberland River above Nashville, based on reports of an examination and survey in 1882 and 1883, was adopted by the river and harbor act of August 5, 1886 (Annual Report, Chief of Engineers, 1884, p. 1661).

This scheme of improvement provided for the construction of 22 locks and dams below Burnside, Ky., and 6 locks and dams at Smith Shoals, above Burnside, the intention being to provide a complete system of lockage from Nashville, Tenn., to Rockcastle River, so as to afford a channel depth of 6 feet, the locks to be 52 feet wide and 280 feet long, with lifts varying from 10 to 12 feet, at an estimated cost of $8,500,000.

On February 26, 1906, the Board of Engineers for Rivers and Harbors reported on the project of canalization as follows:

> The board is of the opinion that the regulation of the river and * * * the completion of Locks and Dams 3, 4, 5, 6, and 7 above Nashville, so as to carry the improvement of the river from its mouth to Carthage, Tenn., is worthy of being continued by the United States, but that the construction of the locks and dams proposed between Carthage and Burnside, except No. 21, now under contract, is not at present justified by the commerce involved.

The river and harbor act of March 2, 1907, adopted the modified project for completing the improvement in accordance with this report by providing for the completion of Locks and Dams Nos. 3, 4, 5, 6, and 7 at an additional expenditure of $550,000, thus reducing the cost of the project as modified to $2,769,000, increased in the report for 1908, page 1690, to $2,854,000. The entire amount so authorized has been appropriated.

The river and harbor act of March 3, 1905, authorized the Cumberland River Improvement Co., of Kentucky, to improve the Cumberland River and tributaries (including the South Fork) above Burnside, Ky., at its own expense, by the construction of the necessary locks and dams under Government supervision. The corporation is granted the use of the resulting water power, subject to the terms of the act, and is required to commence work within 18 months after the completion of Lock No. 21.

The river and harbor act of July 25, 1912, made an appropriation of $5,000 for maintenance of improvement by open-channel work and $2,500 for purchase of flowage rights over lands submerged as a result of the construction of Dams Nos. 6 and 7.

The total expenditures under this project to June 30, 1912, amount to $2,894,154.27, of which sum about $49,230.94 were applied to maintenance.

The expenditures have resulted in an improved channel way by the periodical removal of snags and other surface obstructions, the completion and operation of Locks and Dams Nos. 1 to 7 and No. 21, the latter lock having been opened to navigation in October, 1911.

The completion of Locks and Dams Nos. 1 to 7 has resulted in a good harbor at Nashville and also in affording 6-foot navigation from Nashville to West Point, Tenn., a distance of about 125 miles. After these locks have been longer in operation the effect of the project on freight rates will be more fully apparent. A number of new boats and barges have been placed in commission since the completion of the improvement.

The completion of Lock and Dam No. 21 has resulted in affording steamboat navigation the year round for a distance of 30 miles below Burnside, Ky., and has afforded a fairly good harbor at that locality. This lock has worked a reduction in freight rates of about one-half within the pool area.

The present project of canalizing the rivers above Nashville as far as approved by Congress is practically completed.

The river is navigable from Nashville, Tenn., to West Point, 125 miles, all the year for boats drawing 6 feet; from West Point, Tenn., to Burnside, Ky., 325 miles above Nashville, it is navigable for steamboats of 2½ feet draft from six to eight months and for boats of greater draft from two to three months. Steamboats of light draft can ascend to Burksville, 236 miles above Nashville, for five to eight months and larger boats from four to five months. At fairly low stages, small gasoline boats make occasional trips. The fall is about 223 feet from Burnside to Nashville or about 8 inches per mile. The plane of reference is ordinary low water.

The head of navigation is Burnside, Ky., for steamers and other craft; however, the river for about 35 miles above Burnside is considered navigable for rafting and logging.

The commerce of the Cumberland River above Nashville for the calendar year 1911, as nearly as could be ascertained, aggregated 181,029 short tons, having an estimated value of about $4,087,748; passengers carried, 8,373. The tonnage consisted mainly of timber, farm products, sand and gravel, and general merchandise.

It is proposed to apply the amount required for expenditure in the fiscal year 1914 to work of maintaining the channel above Nashville in a navigable condition by removing surface obstructions.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

CUMBERLAND RIVER BELOW NASHVILLE, TENN.

In its original condition this section of the river was considerably obstructed by rocky ledges, conglomerate, gravel and sand bars, snags, and other surface obstructions, on account of which navigation was rendered very uncertain. The general direction of flow is northwest.

The modified or existing project contemplates the completion of the canalization scheme by the construction of five additional locks, beginning with Lock B, about 51.5 miles below Nashville, and ending with Lock F, about 147 miles below Nashville, thus reducing the total number of locks from seven to six. The proposed locks are to be 52 feet wide and 280 feet long, with lifts varying from 10 to 13.1 feet. It also includes dredging the rest of the river to the mouth (about 46 miles) to a depth of 6 feet at low water, the total estimated cost of the additional improvement being $3,164,882.40.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $472,255.42, of which $34,011.03 was applied to maintenance. Under the project of canalization, approportions, and allotments aggregating $923,000 have been made, which, together with the receipts from other sources amounting to $1,002.80, makes a total of $924,002.80. The construction of Locks B and C is provided for under continuing contract appropriations.

The act of June 25, 1910, appropriated $213,000 cash and authorized contracts to an additional amount of $450,000.

The sundry civil act of March 4, 1911, made a further appropriation of $250,000 under this authorization, leaving $200,000 still to be appropriated.

Approximately one-sixth of the project has been accomplished to June 30, 1912.

These expenditures have resulted in the periodical removal of snags and other surface obstructions from the navigable channel, the protection of the bank of a part of Cumberland Island in Kentucky Chute at the mouth of the river, and the completion and placing in operation of Lock A, November 26, 1904, whereby 6-foot navigation has been afforded all year round for a distance of 38.8 miles above the lock. The season of profitable navigation from the Ohio River to Nashville has been prolonged by 45 to 90 days, depending on the stage of water, making it now average eight months annually. Lock A is 41.4 miles below Nashville.

The Cumberland River below Nashville is usually navigable for all steamboats plying on it for six months in each year; for boats not drawing over 3 feet, from six to eight months, and for boats drawing 16 inches or less, the whole year. General navigation, however, is practically closed for several months each year during low water. As a general rule, when the stage is below 2½ feet, navigation is closed; between 2½ feet and 5 feet it is uncertain and above 5 feet good. A table is given on page 390 of the Annual Report of the Chief of Engineers for 1902, showing the stages at Burnside, Carthage, Nashville, and Clarksville for the years 1898–1902. The plane of reference is ordinary low water.

The head of navigation for this section is Nashville. The navigable portion extends to the mouth, 193 miles.

The reported commerce for the calendar year 1911 was 223,278 short tons, having an estimated value of about $3,549,114. Passengers carried, 4,500. The tonnage consisted principally of timber and farm products and general merchandise.

It is reported that the Tennessee Central Railroad, which parallels the Cumberland River from Nashville to Clarksville, had rates in force before the completion of Lock and Dam A of from 18 to 26 cents per 100 pounds, and since this lock was put in operation these rates have been reduced above the lock to from 6 cents to 12 cents per 100 pounds. There is little doubt that the competition offered by the Cumberland River, even in its present condition, is the cause of the favorable rates into Nashville.

The amount required for expenditure in the fiscal year ending June 30, 1914, will be applied toward the construction of locks.

July 1, 1912, balance available	$451, 577. 19
Amount appropriated by river and harbor act approved July 25, 1912	305, 000. 00
Amount available for fiscal year ending June 30, 1913	756, 577. 19
July 1, 1912, amount covered by uncompleted contracts	488, 434. 40
Amount of continuing contract authorization, act of June 25, 1911	450, 000. 00
Amount appropriated under such authorization	250, 000. 00
Amount yet to be appropriated	200, 000. 00
Amount (estimated) required to be appropriated for completion of existing project	[1] 2, 401, 882. 40
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	200, 000. 00
For maintenance of improvement	5, 000. 00
Total	[1] 205, 000. 00

FRENCH BROAD AND LITTLE PIGEON RIVERS, TENN.

The French Broad River is one of the largest tributaries of the Tennessee. It rises in North Carolina, flows in a generally northwesterly direction, and finally unites with the Holston River in the State of Tennessee, about 4.5 miles above Knoxville, to form the Tennessee River. It has a drainage area of about 5,600 square miles. Leadvale, Tenn., about 70 miles above the mouth, has generally been considered the head of navigation in Tennessee, and it is not believed that rafting or logging is practicable to any great extent above this point. An isolated portion of the river in North Carolina, between Brevard and Asheville, was under improvement for several years, from 1877 to 1882, and $43,000 was expended in removing obstructing bowlders, fish traps, and snags, and in dredging and constructing wing dams at Cherokee, Big Buck, and other shoals.

In its original condition the river was obstructed by rock reefs, sand and gravel bars, and by bowlders, snags, and overhanging trees, and numerous islands in the river divided the water and diminished the depth in the navigable channels. There were 41 shoals obstructing navigation below Leadvale. The average slope below Leadvale is about 2.3 feet per mile, and the low-water discharge at Leadvale is reported as about 2,000 cubic feet per second.

The Little Pigeon River is formed by the junction of its east and south forks at Sevierville, Tenn., and flows in a northerly direction for about 5 miles, emptying into the French Broad about 29 miles above its mouth. The Little Pigeon is navigable at ordinary stages only about 2 miles above its mouth (to Catlettsburg), and thus practically amounts to an additional landing on the French Broad. In its original condition this portion of the river was obstructed by a bar at its mouth.

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[1] Exclusive of amount available for fiscal year 1913.

The present project, based on the survey of 1870 (Annual Report, 1871, p. 491), was adopted June 14, 1880, and provides for open-river work on the French Broad to secure a navigable channel at low water from the mouth to Leadvale sufficient to permit the passage of boats drawing about 2.5 feet, at an estimated cost of $150,000, and for the removal of the bar at the mouth of the Little Pigeon.

No modification has been made since the adoption of the present project.

The funds expended in the fiscal year 1912, amounting to $11,834.04, were applied to dike construction and channel excavation at Seven Island Shoals, and to repair work, maintenance, and other incidentals pertaining to this improvement. The completion of this work will remove the most serious obstruction to navigation between Dandridge and the mouth of the river. About 50 per cent of the work required at this point has been completed.

To June 30, 1912, $170,000 had been appropriated and allotted for this improvement in both North Carolina and Tennessee, and $503.01 had been received from other sources, making an aggregate of $170,503.01.

The amount expended to June 30, 1912, for work in the State of Tennessee was $126,894.51, of which $17,029.84 was for maintenance. These expenditures have been applied to the improvement of some 16 shoal places in the French Broad River, the maintenance of the navigable channel, and the removal of the bar at the mouth of the Little Pigeon River.

The maximum draft that can be carried over the shoalest place at mean low water is probably about 18 inches. The extreme flood oscillation is about 30 feet, ordinary floods having a range of about 10 to 15 feet. Steamboats rarely go above Dandridge, 46.5 miles above the mouth, and all the improvements are below this place. Except at one rock ledge, the low-water channel of 90 feet width and 2.5 feet depth has now been secured from Dandridge down as far as Seven Island Shoals, 32½ miles below, or 14 miles above the mouth.

The commerce carried on the French Broad River in 1911 amounted to 30,224 short tons, valued at $986,740. The direction of traffic is not parallel to rail lines. The effect of the improvement on railroad rates, therefore, would be indeterminate, though doubtless important.

It is proposed to apply the funds estimated for the fiscal year 1914 to open-channel work below Dandridge, with a view to the extension and maintenance of benefits already obtained.

Amount (estimated) required to be appropriated for completion of existing project	$28,515.64
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	15,000.00

TENNESSEE RIVER, ALA. AND KY.

The Tennessee River is 652 miles long. It is formed by the junction of the French Broad and Holston Rivers, 4.5 miles above Knoxville and 188 miles above Chattanooga, and flows into the Ohio at Paducah, 464 miles below Chattanooga. Together with its principal tributaries it forms a system of internal waterways capable of being navigated more than 1,300 miles by steamboats. In addition to this, its tributaries are still farther navigable by rafts and flatboats for a distance of more than 1,000 miles, thus making a system of navigable waters about 2,350 miles in length, with a drainage area of about 44,000 square miles.

The river is navigable the entire year from the mouth to Hamburg, Tenn., about 200 miles, with 4 to 5 feet draft, and 26 miles farther to Riverton, Ala., with 3 feet draft. Just above Riverton a lateral canal about 8 miles long has just been completed past the Colbert and Bee Tree Shoals, and the Muscle Shoals Canal now surmounts the Big Muscle and Elk River Shoals.

Under the act of April 26, 1904, as amended by act of January 7, 1905, a lock and dam to be built mainly by private parties are projected at Hales Bar, designed to form a pool extending 33 miles upstream to Chattanooga. At dead low water at present 2 feet draft is all that can be carried from Riverton 238 miles to Chattanooga, and 18 inches is all that is available from Chattanooga the next 188 miles upward to its head.

Local boat lines have headquarters at the principal towns along the river. There is no through traffic covering the entire length of the river, the longest regular boat service being found between Chattanooga and Paducah when the stage of water permits.

Freight rates are said to be already considerably lowered by this project, but there is no information available indicating to what extent they will be affected by its completion.

1. Tennessee River.—The improvement has been carried on in three sections under separate appropriations until the existing project was adopted by the act of July 25, 1912.

(*a*) *Above Chattanooga, Tenn.* (*188 miles*).—In its original condition this part of the river was obstructed by rock reefs, bowlders, gravel bars, and snags. The depth of water on the bars varied from 10 to 30 inches at low water, and in some places the current was as great as 6 miles an hour. The average slope is 0.956 foot per mile, with average low-water discharge varying from about 3,000 cubic feet per second at Knoxville to about 6,000 cubic feet per second at Chattanooga.

The general direction of flow is southwest.

Early projects, between 1832 and 1856, seem confined to obtaining a low-water depth of 2 feet by means of wing dams and dredging. In 1871 a project was adopted providing for 3 feet at low water between Chattanooga and Knoxville, at an estimated cost of $175,000.

Up to June 30, 1895, the sum of $328,255.83 had been expended under a previous project, and there remained 55 obstructions having less than 3 feet depth at low water.

The project, adopted by Congress in act of August 18, 1894, is based on the survey report printed as House Document No. 252, Fifty-second Congress, second session, and is to obtain by training walls, wing dams, and dredging a low-water channel 3 feet deep from Chattanooga to the mouth of the French Broad River, at an estimated cost of $650,000. A revision of the estimate in 1907, on a basis of present unit prices, places the cost of the existing project at $1,709,000.

The river and harbor act, approved July 25, 1912, adopted a project, based on the recommendation contained in House Document No. 360, Sixty-second Congress, second session. The existing project is as follows: (*a*) Construction of lock and dam at foot of Caney

Creek Shoals (including cost of flowage rights) suitable for a 6-foot navigation, at an estimated cost of $1,600,000; (*b*) open-channel work to secure a navigable depth of 3 feet at extreme low water and 4 feet at ordinary low water, at an estimated cost of $1,000,000.

Operations in recent years have been confined to Little River Shoals, a serious obstruction 12 miles below Knoxville, the obstruction extending from Caney Creek Shoals for a distance of 8 miles downstream, and the shoals in the stretch of the river between Knott Landing (about 80 miles above Chattanooga) and the mouth of Richland Creek (about 40 miles farther downstream).

The expenditures during the fiscal year 1912, amounting to $90,967.73, were applied to rock excavation, dredging, and dike construction at Kelly Shoals and Watts Bar, and the construction, repair, and care of floating plant. This included payment of $15,978 for a new dipper dredge, the *Tellico*, which was constructed under contract for furnishing the hull, machinery, and equipment complete. With two complete dredging outfits at work, the rate of progress on the work undertaken during the present working season has been greatly increased over that attained in the past.

Appropriations and allotments under the present project amount to $538,504.54, and the receipts from sales, etc., have been $170, making a total of $538,674.54.

The total amount expended under the present project to June 30, 1912, is $481,593.19, including $68,946.63 for maintenance. The expenditures have resulted in improved conditions of navigation at some of the worst localities of this section of the river, notably at Caney Creek, Little River, and Kelly Shoals.

The commerce reported on this section of the river for the calendar year 1911 amounted to 394,176 short tons, valued at about $2,856,227. The quantities of the various items included in this traffic were sand and gravel, 135,057 tons; iron ore, 122,359 tons; logs (mainly rafted), 33,685 tons; marble, 42,936 tons; farm products, 19,401 tons; miscellaneous commodities and general merchandise, 40,738 tons. The effect of the project on freight rates is not yet fully apparent.

In accordance with the new project adopted by the river and harbor act of July 25, 1912, it is proposed to expend about $15,000 in making a location survey for the lock and dam at the foot of Caney Creek Shoals and the balance in open-channel work and purchase of necessary plant. It is recommended that the sum of $200,000 be provided for the fiscal year 1914 to be applied to the purchase of necessary floating plant, dredging, rock excavation, and dike construction; $10,000 for maintenance; and an initial appropriation of $300,000 be made for the construction of the newly projected lock at the foot of Caney Creek Shoals, with a contract authorization for the entire balance of the estimate for its completion. The appropriation recommended is for the extension of benefits and also to make the improvements available.

Tennessee River above Chattanooga.

Amount (estimated) required to be appropriated for completion of existing project	$2,500,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	510,000

(*b*) *Chattanooga, Tenn., to Riverton, Ala.* (*238 miles*).—In its original condition the channel from Chattanooga to Browns Ferry was obstructed by bars, bowlders, reefs, and rocky projections. Navigation was possible during six to nine months annually. Between Browns Ferry and Florence were the Muscle Shoals obstructions, which could be crossed only at unusually high water. Between Florence and Riverton the Colbert and Bee Tree Shoals prevented navigation for six months in the year.

The average slope is 1.5 feet per mile from Chattanooga to Scott Point (17.5 miles), thence 0.4 foot per mile to head of Muscle Shoals Canal (158 miles), thence 2.73 feet per mile to Riverton (62.5 miles), with average low-water discharge varying from about 6,000 cubic feet per second at Chattanooga to about 10,000 cubic feet per second at Riverton. The general direction of flow is west.

Under a former project the Muscle Shoals section was improved, at a cost of $3,191,726.50, by some channel work at Little Muscle Shoals and by the construction of a lateral canal in two divisions, one on the left bank about 3.5 miles long, with 2 locks, around the Elk River Shoals, and the other on the right bank, about 14.5 miles long, with 9 locks, around the Big Muscle Shoals. This work was done mainly from 1875 to 1890, under a project adopted originally in 1868.

Expenditures aggregating $595,532.74 have been made in the improvement of the open river at various localities between Chattanooga and Riverton under a former project, dating back to 1868, which contemplated securing a least depth of 3 feet at low water in the improved channels.

The projects for the improvement of this section prior to that adopted by the act of July 25, 1912, were three in number.

The first authorizes the construction by private interests of a lock and dam at Hales Bar, about 33 miles below Chattanooga, which will form a pool extending several miles above Chattanooga with a depth of at least 6 feet at low water, the company doing the work being granted the use of the water power produced by the dam for a period of 99 years. The project was adopted by act of April 26, 1904, amended (as to location of the work) by act of January 7, 1905. The terms of the act required that the United States should prepare the plans, supervise the construction, and provide the gates, valves, operating machinery, and other appurtenances of the lock. The revised estimate of the total cost to the United States was $214,720. There has been no modification of project since its adoption.

The second project, adopted by act of March 2, 1907, and based on the report of the survey from Scott Point to Lock A, printed as House Document No. 50, Fifty-seventh Congress, first session, provides for open-channel work. As extended in scope by the act of June 25, 1910, it contemplates securing a depth of 5 feet at low water between Chattanooga and Riverton, with the exception of the intervals covered by the Hales Bar lock and dam, the Muscle Shoals Canal, and the Colbert Shoals Canal. The revised estimate of the total cost of this project was $1,481,500, exclusive of sums appropriated prior to March 2, 1907.

The third project provides for the improvement of Colbert and Bee Tree Shoals, near the downstream limit of this section, by the construction of a lateral canal about 8 miles long, with one lock of about 26 feet lift, at an estimated cost of $2,847,009.70. The original project, based on the report of a board of engineer officers (Oct. 28, 1890), was approved by the Secretary of War on November 28, 1890, and its last modification on June 12, 1905.

The river and harbor act approved July 25, 1912, modified the project in accordance with recommendations in House Document 360, Sixty-second Congress, second session; the proposed modified project being as follows: (*a*) Between Chattanooga and Browns Island, lock and dam at Crow Creek Island, and open-channel work to secure a depth of 6 feet at ordinary low water (5 feet at extreme low water), with permanent works for a 7-foot depth (extreme low water occurs seldom and then for only a few days at a time), estimated to cost $3,000,000; (*b*) between Florence and Riverton, open-channel work to secure a depth of 6 feet at ordinary low water (5 feet at extreme low water), at an estimated cost of $500,000. The estimates made for the work on the stretch of river between Florence and Colbert Shoals, as given in House Document No. 360, Sixty-second Congress, second session, were based on low water assumed in survey made in 1891.

Hales Bar.—During the past fiscal year the sum of $35,094.76 (which does not include $127.05 expended for the Isthmian Canal Commission) was expended, which was applied principally to the cost of erecting the upper and lower lock gates under contract and to the cost of inspection of construction of the lock and dam under contract.

Appropriations and allotments under this project (Hales Bar Lock and Dam) amount to $229,720; $18.29 was received from other sources, making a total of $229,738.29, of which sum $144,720.35 has been expended to June 30, 1912. This is exclusive of the $127.05 expended for the Isthmian Canal Commission, for which a transfer settlement has not yet been made. The present time for the completion of this work is April, 1913. This improvement will not be available until completed. The entire amount estimated to be required for the completion of the work to be done by the United States in connection with the Hales Bar improvement has been appropriated.

Open-channel work.—During the past fiscal year the sum of $145,730.88 was expended, which was applied principally to rock excavation and dredging at Tuscumbia Bar and Buck Island Shoals, and to the maintenance and construction of floating plant, including a new dipper dredge, on which payments were made during the fiscal year of about $38,000, of which $20,000 was paid under a contract for the machinery. These localities are considered the worst obstructions in the middle section of the Tennesee River.

Appropriations and allotments under this project (for open-channel work) amount to $616,674.24; $56.63 was received from other sources, making a total of $616,730.87, of which sum $417,662.70 has been expended to June 30, 1912. Of the latter amount $26,997.02 has been expended for maintenance. The expenditures have resulted in the improvement of the open-river channel at various points between Chattanooga and Riverton, notably at Allens Bar, Burdine Bar, Tuscumbia Bar, and Buck Island Shoals.

The maximum draft that can be carried at mean low water over the shoalest places between Chattanooga and Riverton is about 2 feet. The extreme flood oscillations range from about 69 feet at the Suck, 12 miles below Chattanooga, to about 10 feet at Lock 4 of the Muscle Shoals Canal.

The river freight reported as having been handled on this section in the calendar year 1911 amounted to 60,360 short tons of timber products, 20,840 short tons of merchandise, 108,244 short tons of sand and stone, and 18,976 short tons of farm products. In addition, the Nashville, Chattanooga & St. Louis Railway, which operates a car ferry between its terminals at Hobbs Island, on the north bank, and Guntersville, on the south bank (22 miles upstream), handled 83,600 tons of rail freight by means of transfer boats (without unloading from cars), making a total commerce in the section between Chattanooga and Florence of 292,020 tons, valued at approximately $11,151,471. The effect of this project on freight rates will not be fully apparent until the completion of the work of improvement between Florence and Riverton.

The river and harbor act of July 25, 1912, carries an appropriation of $10,000 for the section " between Chattanooga and Browns Island " and $120,000 for the section " between Florence and Riverton." It is proposed to expend the $10,000 above mentioned for maintenance and in making the lock-location survey for the lock and dam at Crow Creek Island, and the $120,000 to open-channel work and contingencies.

It is recommended that $485,000 be provided for the fiscal year 1914 for the section from Chattanooga to Riverton, to be applied as follows: $100,000 to open-channel work in the section between Chattanooga and Browns Island; $100,000 to open-channel work in the section between Florence and Riverton; $10,000 for maintenance; and $275,000 to the construction of the lock and dam between Chattanooga and Browns Island, with a contract authorization for the entire balance of the estimate for the completion of the lock and dam, in order that the work may be prosecuted to completion at the earliest date practicable. The appropriation is required in order that the improvements may be made available and also for the extension of benefits.

Colbert Shoals Canal.—During the past fiscal year the sum of $54,117.13 was expended, which was applied principally to the work of erecting the guard gates under contract, installing sluice-valve operating machinery, and to bank protection. The canal, although not quite completed, was opened to navigation in November, 1911.

Appropriations and allotments under the present project amount to $2,313,000; $9,132 was received from other sources, making a total of $2,322,132, of which sum $2,320,163.11 has been expended to June 30, 1912.

The expenditures have resulted in placing the canal in operation. Some additional work will be necessary at this place for the purpose of properly protecting the canal. Attention is invited to the remarks in this connection in the annual report for 1911, pages 722 and 2048. Negotiations are now pending for the purchase of 15 acres of land at the canal for the purpose of making certain improvements for protecting the canal embankment against erosion during high stages of the river, and also for furnishing additional mooring space for vessels using the canal. This subject was treated in detail in the appendix to the annual report for 1911, page 2049.

(*c*) *Below Riverton, Ala.* (*226 miles*).—This section of the river lies below most of the large tributaries, and the slope being uniform and moderate and the width nowhere excessive it affords unusual facilities for navigation. The general direction of the flow is north. The ruling low-water depths were originally about 3.5 feet over the lower 196 miles and 2 feet in the remaining portion. The average slope is 0.34 foot per mile, and the low-water discharge is about 10,000 cubic feet per second. In 1896 there were 49 localities having less than 5 feet depth at low water, and several other shoals have since developed.

The original project, originally adopted September 19, 1890, and subsequently extended in its scope by the acts of August 18, 1894, and March 3, 1899, is to obtain, by dredging, a channel not less than 5 feet deep and 150 feet wide, and to protect Livingston Point and Tennessee Island from erosion with a view to preserving the port of Paducah, Ky.

A survey of this portion of the river was made pursuant to an act of Congress of August 18, 1894, but no definite plan of improvement appears to have been recommended at the time further than a suggestion that channel excavation by dredging should be given a trial. The present plan is the outcome of the successful application of this method.

The river and harbor act approved July 25, 1912, adopted a modification of the present project, based on report printed in House Document No. 360, Sixty-second Congress, second session, as follows: Open-channel work to secure a depth of 6 feet at ordinary low water (5 feet at extreme low water), estimated to cost $600,000.

There were no active operations carried on during the fiscal year 1912, the amount expended ($68,727.52) being applied to payments for floating plant, including the dredges *Watauga* and *Tishomingo*. These vessels being practically completed during the fiscal year, it was intended to use these vessels in connection with rock excavation at Big Bend Shoals (just above Hamburg, Tenn.), the most formidable obstruction below Riverton, but it was found advantageous to transfer them to the middle section of the river, where they can be used effectively, pending an effort to let the Big Bend work by contract. Should no satisfactory bid be received, the work will be done by hired labor, for which considerable additional floating plant will be necessary.

The appropriations and allotments for this section amount to $634,197.74, and sums aggregating $849.89 have been received from other sources, making a total of $635,047.63.

The total amount expended to June 30, 1912, was $534,051.92, including about $85,028.65 for maintenance. These expenditures have resulted in the completion of the work at Livingston Point and Tennessee Island at a cost of $83,501.65, including maintenance; in the removal of snags and the dredging of approximately 1,661,420 cubic yards of gravel at about 35 localities, thus removing the worst obstructions below Hamburg (about 26 miles below Riverton, Ala.); and in providing and maintaining the dredging plant required in carrying on the improvement. The results of the dredging operations appear to be fairly permanent at nearly all of the places improved.

The maximum draft that can be carried over the shoalest place in this section at mean low water is about 3 feet. The extreme flood oscillations range from about 48 feet at Johnsonville to about 55 feet at Paducah.

The commerce carried on the river between Florence and Paducah in the calendar year 1911 amounted to about 431,113 short tons, the total value of which was estimated at $7,394,412. The item of railroad ties constituted nearly three-fifths of the tonnage, other timber products amounted to 67,776 short tons, farm products to about 23,493 short tons, and miscellaneous merchandise to about 40,609 short tons.

It is proposed to expend the amount carried by the river and harbor act of July 25, 1912, to work of improvement at Big Bend Shoals. The sum of $110,000 should be provided for 1914, to be expended in continuing improvement at Big Bend Shoals and for maintenance.

BELOW RIVERTON.

Amount (estimated) required to be appropriated for completion of existing project	$490,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	110.000

CLEVELAND HARBOR, OHIO.

Originally Cleveland Harbor was simply the mouth of Cuyahoga River, in which the water was shoal, and sometimes the entrance was entirely closed to boats by the sand. The first improvement was undertaken in 1825, and the plan contemplated straightening the channel and making it permanent by side jetties. The channel was dredged when necessary. The total expenditure under this plan was $346,244.84.

In 1875 a project was adopted for a breakwater of stone-filled timber cribs in 5 fathoms of water. The west breakwater was commenced in 1876 and completed in 1883, a total length of 7,130 feet. The east breakwater was commenced in 1888 and continued at intervals until 1893, when its length was 2,494.5 feet. In 1895 an opening of 200 feet was made in the shore arm of the west breakwater as a sanitary measure.

In 1896 Congress authorized the completion of the improvement at a total estimated cost not to exceed $1,354,000, in accordance with a project published in Annual Report of the Chief of Engineers for 1896, pages 2949 to 2953, inclusive. This project involved the completion of the east breakwater, providing for an additional length of about 3,000 feet; removing superstructure of the old west breakwater to a depth of 2 to 3 feet below water level and replacing it with a superstructure of concrete masonry; reenforcing the cribs below the masonry; sheathing the face of the east breakwater; removing and rebuilding the east and west piers and widening the mouth of the river. A continuing contract for the work was authorized.

The river and harbor act of 1899 authorized the deepening of the channel and sheltered area by dredging to a depth of 21 feet, which depth was increased to 25 feet by the river and harbor act of June 13, 1902. The estimated cost of the work was $478,400. (See Annual Report of the Chief of Engineers for 1899, pp. 3076 to 3078, inclusive, for project, and p. 3061 for estimate as revised.)

The river and harbor act of June 13, 1902, authorized a further modification of the project by providing for improving and enlarging the entrance to the harbor and for extending the breakwater eastward to Gordon Park, in the city of Cleveland, a distance of about 16,000 feet, at a total estimated cost of $4,481,456. This project is described in the Annual Report of the Chief of Engineers for 1901, pages 3277 to 3299, inclusive. The act authorized an expenditure of $2,800,000, all of which has been appropriated, but this authorization was increased by $900,000 in the river and harbor act of March 2, 1907, of which $51,000 is yet to be appropriated. This act also appropriated $98,000 for the construction of a Government dock at the foot of Erie Street, in the city of Cleveland, in accordance with plan printed in House Document No. 270, Fifty-ninth Congress, second session, contingent upon the consent of the Cleveland Yacht Club, which holds a lease of this frontage.

The river and harbor act of June 25, 1910, authorized the connecting of the timber portion of the east breakwater with the new east breakwater extension and the removal of the inclined breakwater, and appropriated $250,000, in addition to authorizing $75,000 from previous appropriations, or a total of $325,000 for this work.

The existing project for the improvement of Cleveland Harbor is therefore a combination of those authorized by the acts of 1875, 1896, 1899, 1902, 1907, and 1910.

There has been expended on the authorized project to June 30, 1912, $6,573,821.26, of which amount $575,541.20 was for maintenance during the past nine years. Prior to that time the amounts expended for works of improvement and for maintenance were so involved that it is impracticable to separate them.

Prior to the present fiscal year, under various contracts, the mouth of the river was widened by dredging, and the east and west piers were rebuilt, as intended, except a small amount of pier construction and excavating on the westerly side of the river in the vicinity of the Lake Shore Railway bridge to widen the channel. This work is waiting for title to the necessary real estate, which the city of Cleveland has undertaken to acquire for the United States. The superstructure of the west breakwater was removed and replaced by concrete masonry and the lake side of the cribs was partly protected with riprap. The old east breakwater was repaired and extended according to the project of 1896, except as modified by the river and harbor act of June 13, 1902, which reduced the length of the inclined shore arm by 270 feet. The new main entrance was completed. This work consists of two pierheads, two projecting breakwaters, and rubble mound protection to the old structure. The westerly 10,000 feet of the east breakwater extension is completed. The wharf at the foot of East Ninth Street is completed.

From 1899 to 1904, 766,928 cubic yards of material was excavated in the harbor. This was in the nature of maintenance work. Since 1904 dredging in the basins and jetted channel has been carried on as available funds permitted.

During the fiscal year the following work was accomplished: Work was in progress under a contract dated January 14, 1909, for the further extension of the east breakwater and is now about 69 per cent completed; work was in progress under a contract dated November 18, 1910, for constructing a section of breakwater to close the "gap" at the foot of East Ninth Street and for removing the inclined arm of the old east breakwater, and is now about 72 per cent completed; work was in progress under a contract dated December 12, 1910, for repairing the timber portion of the east breakwater and is now about 97 per cent completed.

The U. S. dredge *Burton* removed 20,946 cubic yards of material from the east basin.

The construction of the further extension of the east breakwater is being carried on under a continuing contract authorization, and the sum of $51,000 is estimated for this work during the year 1914. An estimate of $25,000 is also submitted for the year 1914 for maintenance of the completed works of improvement, including dredging and repairs to breakwaters.

As a result of the expenditures a navigable channel 25 feet in depth has been provided at the mouth of the river, and the large outer harbor has been partially constructed, a portion of which is available for docks and anchorage. The project as a whole, so far as definitely authorized by Congress, is regarded as 90 per cent completed.

Cuyahoga River has a navigable depth of about 20 feet for a distance of about 5½ miles above its mouth and is maintained by local authorities.

The usual variation in the level of the water surface during the season of navigation is from 1 foot above to 2 feet below mean lake level. Fluctuations due to wind are about 2 feet.

All depths are referred to mean lake level, 1860–1875; elevation, 572.77 feet above mean tide at New York.

The commerce of Cleveland Harbor for the calendar year 1911 amounted to 10,949,760 short tons, a decrease of 2,436,846 tons from that reported for the calendar year 1910.

There has been a marked reduction in freight rates since the project was inaugurated, but it is impracticable to determine how much of this reduction is due to this particular improvement.

Amount of continuing contract authorization, act of Mar. 2, 1907	$900,000
Amount appropriated under such authorization	849,000
Amount yet to be appropriated	51,000
Amount (estimated) required to be appropriated for completion of existing project	51,000
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	$51,000
For maintenance of improvement	25,000
Total	76,000

CONNEAUT HARBOR, OHIO.

This harbor comprises the lower 3,000 feet of Conneaut Creek and is located about 74 miles by water and 67 miles by rail easterly from Cleveland, Ohio. In its natural condition the creek was obstructed by a bar at its mouth, over which the average depth of water did not exceed 2 feet at ordinary lake level.

The first improvement was undertaken in 1829, and consisted in the construction of parallel jetties of timber cribs filled with stone. The greatest depth obtained under this project did not exceed 12 feet.

No appropriations were made for this harbor from 1880 to 1892. At the end of this period the jetties were in a decayed and dilapidated condition, and the channel had filled up with sand and silt and had practically reverted to its original condition. The harbor could only be used by small sailing craft such as were then engaged in fishing.

In 1892 a project was prepared which provided for the construction of parallel jetties 200 feet apart and extending outward to a depth of 17 feet in the lake, and appropriations under this project were made to 1896.

Expenditures on the early projects were $192,448.47.

A project was authorized by the river and harbor act of June 3, 1896, and is described in the Annual Report of the Chief of Engineers for 1896, pages 2970–2972, inclusive. This project provides for the completion of the jetties to a depth of 17 feet in the lake, and the construction of two detached breakwaters converging toward the lake and designed to shelter the entrance to the jettied channel, and for securing a navigable depth of 20 feet in the channel and sheltered area. The estimated cost of the work was $610,000, exclusive of maintenance.

The river and harbor act of June 25, 1910, appropriated $144,900 for maintenance and continuing improvement in accordance with the report contained in House Document No. 653, Sixty-first Congress, second session. This report includes plans for extensions to the east breakwater, a new west breakwater, the removal of portions of the existing west breakwater and east pier, and dredging in the outer harbor, all at an estimated cost of $1,338,681, with not to exceed $10,000 annually for maintenance.

The river and harbor act of February 27, 1911, appropriated $160,000 for continuing the improvement and authorized a contract or contracts not to exceed $120,738 additional for prosecution of the project, of which $20,738 remains to be appropriated.

The existing project is therefore that of 1896, as modified and enlarged by the act of 1910.

The total amount expended on the existing project to June 30, 1912, was $842,824.33, of which amount $51,079.32 was for maintenance during the past nine years. Prior to that time the amounts expended for works of improvement and for maintenance were so involved that it is impracticable to separate them.

The work of protecting the east breakwater and extending it shoreward, under a contract dated September 6, 1910, was completed August 22, 1911. The work of constructing a portion of the lakeward extension of the east breakwater, a portion of the new west breakwater, and of removing a portion of the old west breakwater was commenced September 18, 1911, under a contract dated July 3, 1911. This work is now about 26 per cent completed. It is being carried on under a continuing-contract authorization aggregating $120,738, of which $20,738 is yet to be appropriated.

As a result of expenditures an entrance channel 21 feet deep and an outer harbor have been provided.

The modified project is regarded as about 43 per cent completed.

A 20-foot channel extends up the river 3,000 feet above its mouth and is maintained by local authorities.

The water-surface variations are similar to those at Cleveland.

All depths are referred to mean lake level 1860–1875, elevation 572.77 feet above mean tide at New York.

The commerce of Conneaut Harbor for the calendar year 1911 amounted to 8,879,277 short tons, an increase of 431,376 tons over that reported for the calendar year 1910.

There has been a marked reduction in freight rates since the project was inaugurated, but it is impracticable to determine how much of this reduction is due to this particular improvement.

For report on preliminary examination and survey of Conneaut Harbor, Ohio, with a view to enlarging and improving the outer harbor area, see Report of the Chief of Engineers for 1910, page 879, and House Document No. 653, Sixty-first Congress, second session (with map).

July 1, 1912, balance available	$111, 952. 90
Amount appropriated by sundry civil act approved Aug. 24, 1912	100, 000. 00
Amount available for fiscal year ending June 30, 1913	211, 952. 90
July 1, 1912, amount covered by uncompleted contracts	162, 066. 84
Amount of continuing-contract authorization, act of Feb. 27, 1911	120, 738. 00
Amount appropriated under such authorization	100, 000. 00
Amount yet to be appropriated	20, 738. 00
Amount (estimated) required to be appropriated for completion of existing project	[1] 938, 781. 00

PORT CLINTON HARBOR, OHIO.

The harbor of Port Clinton comprises the lower half mile of the Portage River. It is about 72 miles westerly from Cleveland by both land and water. The Portage River in its natural condition was rarely more than 5 feet deep across the bar at its mouth.

The original project for its improvement was adopted in 1871 and was slightly modified in 1872 and 1873. It provided for the construction of two parallel jetties extending outward from the mouth of the river to a depth of 10 feet in the lake, at an estimated cost of $90,000. These were to be built of timber and stone.

In 1883 the east jetty had been extended 2,180 linear feet and the west jetty 1,948 linear feet. These lengths were thought sufficient for the requirements of this harbor, and in 1894, at which time a total expenditure of $71,949.86 had been made, it was recommended that the remainder of the estimated cost of executing the project ($21,000) be expended for necessary repairs.

No work under contract has been done at Port Clinton during the year.

Government property has been stored on the Government reservation at Port Clinton during the year, and a watchman has been employed for its care.

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[1] Exclusive of the balance unexpended July 1, 1912.

The project since 1894 has been one for maintenance, under which $33,411.58 has been expended for dredging, repairing the jetties, and contingencies.

The result of expenditures has been to produce a channel about 10 feet in depth, extending for one-half mile above the mouth of the Portage River, which was the maximum draft that could be carried June 30, 1912. A channel of 6 feet depth extends to Oak Harbor, 12 miles above the mouth of the river.

All depths are referred to mean lake level, 1860–1875, elevation 572.77 feet above mean tide at New York.

The commerce of Port Clinton for the calendar year 1911 amounted to 8,052 short tons, a decrease of 2,725 tons from that reported for the calendar year 1910.

The project has had little effect on freight rates, as the commerce of the port is small.

The appropriation recommended will be applied to maintenance to keep the improvement available.

For report on preliminary examination and survey of Port Clinton Harbor, Ohio, see Report of the Chief of Engineers for 1910, page 879, and House Document No. 815, Sixty-first Congress, second session (with map).

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$500

TOLEDO HARBOR, OHIO.

The harbor of Toledo is located 99 miles by water and about 120 miles by rail westerly from Cleveland.

The total amount expended on original and modified projects prior to operations under existing project is $1,624,695.45.

A project was adopted by the river and harbor act of March 3, 1899, and is described in the Annual Report of the Chief of Engineers, 1898, pages 2693 to 2705, inclusive. It provides for a channel in the bay and river 400 feet wide and 21 feet deep to Fassett Street Bridge and 200 feet wide and 21 feet deep for the section above the bridge, with a turning basin 500 feet wide at the upper end. A dike was also to be constructed 1,000 feet in length between the range lights in the bay. The estimated cost of the work was $1,005,000. A continuing contract was authorized for its execution, the limit of cost being fixed at $950,000, all of which except $15,000 has been appropriated.

The work contemplated by this project has been completed with the exception of the channel and basin above the Fassett Street Bridge, where the channel has a width of only 100 feet.

The river and harbor act of June 25, 1910, appropriated $145,000 for continuing improvement in accordance with the report submitted in House Document No. 865, Sixtieth Congress, first session, and an additional amount of $75,000 was appropriated for continuing the improvement by the river and harbor act of February 27, 1911.

The present project therefore is a modification of that adopted March 3, 1899, and provides for a channel 400 feet wide and a depth that will insure a navigable channel way of 21 feet, which requires a depth of about 23 feet at mean lake level, from deep water in the lake to the Fassett Street Bridge, a distance of about 14 miles, at an estimated additional cost of $400,000, and maintenance of the completed channel at an estimated cost of $25,000 a year.

Maintenance dredging in the channel has been done when necessary by contract and by United States dredging plant.

The total expenditure under the project of 1899 and subsequent modifications to the close of the fiscal year ending June 30, 1912, was $1,094,578.93, of which amount $209,937.65 was for maintenance during the past nine years. Prior to that time the amounts expended for works of improvement and for maintenance were so involved that it is impracticable to separate them.

The work contemplated by the modified project is regarded as about 70 per cent completed.

During the past year the U. S. dredge *Burton* excavated 53,347 cubic yards of material from the Maumee River, and 32,184 cubic yards of material from the channel through Maumee Bay. Cost of maintaining dredging plant and of raising the U. S. dredge *Maumee*, which was wrecked on the breakwater at Cleveland, was also charged in part to this appropriation.

Under a contract for deepening the channel through Maumee Bay and Maumee River to 21 feet below low water of 1895, dated June 19, 1911, work has been about 53 per cent completed. Five hundred and ninety-one thousand one hundred and ninety-four cubic yards of material has been removed and the required depth has been secured over the outer 13,900 feet of channel and in part over 6,900 feet additional.

The result of these expenditures has been to create and maintain a channel through Maumee Bay and River 400 feet wide and 23 feet deep for the outer 2¼ miles, 400 feet wide and 21 feet deep thence 12½ miles up to Fassett Street Bridge, and to a width of 100 feet and a depth of 20 feet for 1 mile above this bridge. The Maumee River is also navigable for launches to Perrysburg, 15 miles above the mouth.

The usual variations in the level of the water surface during the season of navigation range from 1 foot above to 2 feet below mean lake level. Temporary fluctuations, due to wind, of 7.9 feet above to 7.1 feet below mean lake level have, however, been observed at Toledo.

All depths are referred to mean lake level, 1860–1875, elevation 572.77 feet above mean tide at New York.

The commerce for Toledo for the calendar year 1911 amounted to 6,407,878 short tons, a decrease of 12,514 tons from that reported for the calendar year 1910.

There has been a marked reduction in freight rates since the project was inauguarted, but it is impracticable to determine how much of this reduction is due to this particular improvement.

The appropriation recommended will be applied toward continuing improvement by dredging under existing project, and for maintenance.

Amount (estimated) required to be appropriated for completion of existing project	$105,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and maintenance	105,000

OHIO RIVER LOCKS AND DAMS.

The river and harbor act approved June 25, 1910, adopted a project for the improvement of the entire Ohio River by the construction of locks and movable dams, with a view to securing a navigable depth of 9 feet, in accordance with the report submitted in House Document No. 492, Sixtieth Congress, first session, or such modification thereof as, in the discretion of the Secretary of War, may be advisable, and with a view to the completion of such improvement within a period of 12 years. Since the adoption of this project the items making appropriations for the work, exclusive of locks and dams previously authorized, are as follows:

[River and harbor act of June 25, 1910.]

Improving Ohio River: Continuing improvement with a view to securing a navigable depth of nine feet, in accordance with the report submitted in House Document Numbered Four hundred and ninety-two, Sixtieth Congress, first session, or such modification thereof as in the discretion of the Secretary of War may be advisable, and with a view to the completion of such improvement within a period of twelve years, one million one hundred and fifty thousand dollars, which amount shall be applied to the purchase of sites for eighteen Locks and Dams Numbered Nine, Ten, Twelve, Fourteen, Fifteen, Sixteen, Seventeen, Twenty, Twenty-one, Twenty-two, Twenty-three, Twenty-four, Twenty-five, Twenty-seven, Twenty-eight, Twenty-nine, Forty-one, and Forty-eight, and toward the construction of Locks and Dams Numbered Seven, Nine, Ten, Twelve, Nineteen, Twenty, Twenty-nine, Forty-one, and Forty-eight: *Provided*, That so much of the sum herein appropriated as shall be necessary may be applied toward the definite location and purchase of sites for additional locks and dams on said river: *Provided further*, That the Secretary of War may enter into a contract or contracts for such materials and work as may be necessary to prosecute the said project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate three million five hundred thousand dollars, exclusive of the amounts herein and heretofore appropriated.

[River and harbor act of Feb. 27, 1911.]

Improving Ohio River: Continuing improvement by the construction of locks and dams with a view to securing a navigable depth of nine feet, two million dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for such materials and work as may be necessary to prosecute the said project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate three million dollars, exclusive of the amounts herein and heretofore appropriated.

[Sundry civil act of Mar. 4, 1911.]

Improving Ohio River below Pittsburgh, Pennsylvania: For continuing improvement by the construction of Locks and Dams Numbered Seven, Nine, Ten, Twelve, Nineteen, Twenty, Twenty-nine, Forty-one, and Forty-eight, one million seven hundred and ten thousand dollars.

[River and harbor act of July 25, 1912.]

Improving Ohio River: Continuing improvement by the construction of locks and dams with a view of securing a navigable depth of nine feet, three million two hundred thousand dollars: *Provided*, That the Secretary of War may enter into a contract or contracts for such materials and work as may be necessary to prosecute the said project, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate two million two hundred thousand dollars, exclusive of the amounts herein and heretofore appropriated.

[Sundry civil act of Aug. 24, 1912.]

Improving Ohio River below Pittsburgh, Pennsylvania: For continuing improvement by the construction of Locks and Dams Numbered Seven, Nine, Ten, Twelve, Nineteen, Twenty, Twenty-nine, Forty-one, and Forty-eight, one million one hundred and forty-one thousand dollars.

Work of creating slack-water navigation on the Ohio River has been in progress for many years, first with a view to securing a depth of 6 feet and afterwards a depth of 9 feet, and prior to the adoption of the new project the practical completion of 12 locks and dams and some work on two others had been provided for by special specific appropriations. Of these, Nos. 1–6, inclusive, 8, 11, 13, 18, 37, and the dam at 41 have been completed, or practically so, and Nos. 19 and 26 are well under way. Nine more locks and dams, i. e., Nos. 7, 9, 12, 14, 15, 20, 28, 29, and 48, and lock at No. 41, have been started since the adoption of the comprehensive project in 1910, and first allotments have been made for Nos. 10, 31, and 43. The lock and dam at No. 41, Louisville, are separate structures, being at opposite ends of the Louisville & Portland Canal, the cost of widening the canal being included in cost of Lock No. 41.

Land has been purchased, or is being purchased, for all sites of locks and dams. In the Pittsburgh and Wheeling districts practically all land has been purchased. In the Cincinnati and Louisville districts all land needed in the near future has been purchased and the remaining land is being purchased as rapidly as consistent with the best interests of the Government.

The new project contemplates a total of 54 locks and dams. The report of the approved project, House Document No. 492, Sixtieth Congress, first session, gives the original estimate for these locks and dams, made in 1906, amounting to $63,731,488, in addition to appropriations previously made. The report contemplates that certain dams should first be built below important cities and tributaries, and then serially in order downstream. As indicated above, there are 26 locks and dams already completed or partly provided for under appropriations made hitherto, leaving 28 to be begun under future appropriations.

The appropriations for slack-water on the Ohio River have amounted to $16,555,225.48 for work authorized prior to the adoption of the new project, and $9,201,000 under the new project, or a total of $25,756,225.48. The total expenditures for slack-water prior to June 30, 1912, were $18,937,837.32. There is an unappropriated contract authorization amounting to $5,849,000.

The execution of surveys, preparation of plans for the locks and dams, and other matters pertaining to the improvement as a whole are made the subject for consideration by a special board of officers of the Corps of Engineers, constituted at the present time as follows: Lieut. Col. Henry C. Newcomer, Lieut. Col. Francis R. Shunk, Lieut. Col. Henry Jervey, Maj. John C. Oakes, Maj. Frederick W. Altstaetter, Capt. W. A. Mitchell, recorder.

Upon the recommendation of the board, the following allotments have been made of the cash appropriations provided under the new project:

Dam No.	River and harbor act of June 25, 1910.	River and harbor act of Feb. 27, 1911.	Sundry civil act of Mar. 4, 1911.	River and harbor act of July 25, 1912.	Sundry civil act of Aug. 24, 1912.
7	$150,000		$250,000	$150,000	$122,000
9	150,000		400,000	150,000	282,000
10	40,000			470,000	
12	150,000		300,000		
14		$330,000		100,000	
15		305,000		150,000	
19	220,000		300,000	100,000	
20	40,000	248,000			167,000
28		250,000		300,000	
29	150,000	52,000	460,000		
31				330,000	
41	50,000	300,000		420,000	570,000
43				550,000	
48	50,000	435,000			
Movable parts				230,000	
Surveys, etc	150,000	80,000		250,000	
Total	1,150,000	2,000,000	1,710,000	3,200,000	1,141,000

The actual construction of the new locks and dams and the operation and care of the completed structures are under the immediate supervision and direction of the district engineer officers at Pittsburgh, Wheeling, Cincinnati, and Louisville. Details of the work of the past year and of proposed future operations may be found in other parts of this report, as follows: Locks and Dams Nos. 1 to 10, on pages 899 to 905; Locks and Dams Nos. 11 to 28, on pages 909 to 915; Locks and Dams Nos. 29 to 40, on pages 886 to 889; and Locks and Dams Nos. 41 to 54; on pages 929 to 939.

In adopting the 9-foot project for the Ohio River the river and harbor act of June 25, 1910, specified that the work should be prosecuted "with a view to the completion of such improvement within a period of 12 years." Inasmuch as it requires from 3 to 4 years to complete one lock and dam on the upper river and even a longer time to complete one on the lower river where the greater portion of the work not yet begun is located, it is apparent that in order to comply with the requirement that the whole improvement shall be completed within a period of 12 years from the date of its commencement, provision will have to be made for beginning construction of all structures several years in advance of the date fixed for completion. There are 28 dams of the 54 to be built on the river which have not yet been commenced. If the system is to be completed by 1922, i. e., 12 years from 1910, the date of the act specifying the period for completion, construction of all of these dams must be begun by 1917. This involves the commencement of construction of at least six dams during each year between 1913 and 1917, inclusive, and necessitates the provision of funds in sufficient amount to permit of such commencement in addition to the amount needed to continue construction of dams whose construction had been previously commenced. After the next few years, when the improvement is well under way, the annual necessities will naturally decrease as the system approaches completion, but for a few years these annual necessities will be greater than one-twelfth of the total cost in order to get the work well started and to make up for past deficiencies in appropriations.

The funds provided during the past year for the Ohio River being less than the average amount needed, those to be provided this year should be correspondingly greater.

With the above facts in mind the following estimates for fiscal year 1914 are submitted:

To cover obligations in connection with work on the 13 locks and dams which have already been commenced and which are to be completed under continuing contract authorizations contained in previous acts, the sum of $5,000,000 is asked for for continuation of the works to be appropriated in the sundry civil act for the fiscal year 1914.

To meet the expenses of operations during the next fiscal year at the two other localities where work will be done by hired labor with Government plant on locks and dams now authorized, and the expenses at other sites where work should be commenced in the near future by contract or otherwise, an estimate of $7,000,000 is submitted as the amount required to be appropriated in the next river and harbor act. Since the construction of a lock and dam will require at least four years, it is not necessary that all of this latter amount be made immediately available, provided the remainder be covered by a continuing-contract authorization, as this will permit additional contracts to be made for those locks and dams for which only partial provision has heretofore been made, and enable as many additional locks and dams to be commenced under contract during the next fiscal year as may be required to carry out the program of completion announced by Congress.

There will be certain small unexpended balances of appropriations, and contract authorizations heretofore made for special dams, remaining after their completion, and it is recommended that a general authorization be given for the use of these balances in work of the general project of improvement by locks and dams.

OHIO RIVER (GENERAL OPEN-CHANNEL IMPROVEMENT).

This work was commenced by the General Government in 1827, when low-water navigation over many of the bars and shoals was impossible for commercial purposes; but the improvements made and maintained since then have provided fairly convenient channels at such places for a profitable light-draft local freight and passenger service during low-water periods. The difference in level of water surface of the river varies; at Cincinnati, nearly midway between the head and mouth of the river, the average annual range during the past 30 years is 48.6 feet.

The project under which operations have been carried on has been a continuous and progressive one, the principal features of the work being the removal of snags, rocks, and wrecks from the general channel; the direct improvement of bars and shoals, by dredging and rock excavation; the construction, repair, and maintenance of low dikes and dams to concentrate and direct the flow of water in improved channels; bank protection and the construction and repair of levees where required in the interest of navigation; the construction, repair, and maintenance of ice piers and harbors; miscellaneous improvement, including surveys, establishment of harbor lines, regulation of encroachment and deposits on the banks of the river or in its channel, and the supervision of construction of bridges across the river. The length of river through which the work extends is but little short of 1,000 miles, and the total expenditure in this district by the Government during the 85 years it has been in progress, exclusive of liabilities outstanding June 30, 1912, is $6,808,389.32.

A contract was entered into on July 25, 1911, for the construction of three steel and iron hull towboats, and the boats have been practically completed.

Under contracts dated March 15 and August 29, 1911, six fuel barges and three steel flatboats were completed and put in service.

The nature of the Ohio River is such that its improvement, whether by canalization (locks and dams) or open channel, can not bring full benefit to navigation interests until the improvement shall have become more continuous than past appropriations have permitted. The unimproved portions afford less depth of channel than the improved sections and limit available draft for the whole river to that required for passing its shoalest parts. Dredging and snagging operations will be required at many places, even after a complete system of canalization is finished, and for open-channel improvement continuous work and simultaneous operations will be absolutely necessary to produce effective results.

Under approved authority plans are being prepared for, or there are in course of construction, the following additional plant: One dipper dredge and one light-draft snagging plant.

The available depth in the Ohio River varies greatly with the fluctuation in river stages. During the fiscal year the available depth has been about the average.

The fluctuations in river stages are indicated by the following readings from characteristic river gauges:

	Highest.	Date.	Lowest.	Date.	Range.
	Feet.	1912.	*Feet.*	1911.	*Feet.*
Dam No. 6	32.1	Apr. 2	1.5	July 25	30.6
Wheeling, W. Va	38.4	Mar. 23	1.3	July 27	37.1
Parkersburg, W. Va	32.5	Apr. 5	.5	Aug. 1	32.0
Point Pleasant, W. Va	40.8	...do....		...do....	40.8
Portsmouth, Ohio	51.0	Mar. 26	1.7	Aug. 3	49.3
Cincinnati, Ohio	53.2	Mar. 27	4.6	July 25	48.6
Louisville, Ky. (lower)	54.3	Mar. 28	3.2	Aug. 16	51.1
Evansville, Ind	42.6	Mar. 31	2.3	Aug. 20	40.3
Paducah, Ky	49.9	Apr. 9–11	1.8	Sept. 5	48.1
Cairo, Ill	54.0	Apr. 7	7.9	Sept. 6	46.1

The available depth in channel may be considered 1 foot greater than gauge readings from Pittsburgh to Louisville and 2 feet greater from Louisville to Cairo.

During the fiscal year no work was done to increase the available depth, but work was confined to the removal of snags and other obstructions and increasing the width of narrow low-water channels, thus bettering navigable conditions.

No estimate can be given of the effect of the improvement thus far made on freight rates. In this connection reference is made to the Report of Ohio River Board (H. Doc. No. 492, 60th Cong., 1st sess.), in which statements are made of present and prospective commerce and the effects of improvements on freight rates, etc.

In order to provide for navigation during comparatively low-water periods in winter, many of the existing dikes and dams will require to be kept in a state of repair, as the movable dams can not safely be operated during a time of even light-running ice, although properly protected steamboats may be able to navigate at such time. The severe losses to floating craft during recent years have shown the importance of maintaining certain of the harbors of refuge afforded by existing ice piers and the providing of others at carefully selected localities.

The commerce of the river during the past year, so far as indicated by statistics that the engineer officer in charge of the river has been able to obtain, was as follows: General merchandise, coal, etc., 12,046,294.5 short tons, at an estimated value of $82,074,878.77; passengers, 3,827,365.

Amount (estimated) required to be appropriated for completion of existing project	Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	$550,000

CHEBOYGAN HARBOR, MICH.

This harbor includes the lower reach of the Cheboygan River and its outlet into the Straits of Mackinac, Lake Huron. The river has its source in Mullet Lake, from which it flows in a northerly direction, emptying into the Straits of Mackinac. The length of the river is 5½ miles. The project covers the river from deep water in the Straits of Mackinac to a lock and dam constructed under State authority, a distance of 11,720 feet, of which 6,000 feet are in the Straits. In 1870, when the original project for improvement was made, there was an available depth of 6 feet at plane 581.67. This project called for a channel 200 feet wide and 14 feet deep, its sides to be protected by pile revetment and piers, and the estimated cost of the work was $395,335.

Operations under this original project were confined solely to dredging, which was carried to a depth of only 13 feet until 1880, when the first of a series of projects which had for their object the obtaining of a 15-foot channel was submitted, and as a result of the work which was carried on under projects submitted in 1880, 1882, 1887, and 1888, a 15-foot channel was secured from the 15-foot contour in the Straits of Mackinac to the State Road Bridge, having a width of 200 feet from the Michigan Central Railroad dock out into the straits and a width within the river available between piers. A turning basin, with clear 15 feet depth, was also provided in front of the steamboat docks.

There was expended on the original project $90,874.42 and $57,055.02 on the modifications begun in 1880.

The present project was adopted by river and harbor act of June 3, 1896, and provides for dredging a channel 18 feet deep below the datum plane 581.67 for a width of 200 feet from the 18-foot contour in the Straits of Mackinac to the outer end of the west pier and inside of that point between lines parallel to and 25 feet from the piers to the State Road Bridge, estimated cost $80,000. Operations under this project were begun in 1895, and by 1903 the projected channel had been completed to within 900 feet of the upper limit of the harbor, which section still remains to be dredged to complete the project.

As stated in report of district officer, it is believed that the completion of the 18-foot channel for the above 900 feet is warranted by existing conditions.

The datum plane for work under this project, which has heretofore been 581.67, is from 1 to 2 feet higher than the mean surface elevation of Lake Huron during the past two years and has been changed to 579 in order to provide the channel depths called for by the adopted project.

The river and harbor act approved March 2, 1907, directed the extension of the improvement from the State Road Bridge to the lock in the Cheboygan River by a channel 8 feet deep and 60 feet wide, the estimated cost of which was $10,797.60.

The existing project, as modified by act of March 2, 1907, contemplates a channel 18 feet deep with a width of 200 feet from the 18-foot contour in the Straits of Mackinac to the outer end of west pier and between lines parallel to and 25 feet from the docks from that point to the State Road Bridge, and a channel 8 feet deep and 60 feet wide from the bridge to the lock in the Cheboygan River.

The amount expended on the work of the existing project up to the close of the fiscal year ending June 30, 1912, is $41,381.25, none of which has been applied to maintenance. It is proposed to expend the funds on hand in restoring channel depths wherever necessary.

The maximum draft that can be carried over the shoalest part of the channel is 16 feet to a point within 900 feet from the State Road Bridge, 8 feet from that point to the bridge, and 7 feet from the bridge to the lock.

Above the lock the river is navigable through what is known as the "Inland Route," through Mullet Lake, Indian River, Burt Lake, Crooked River and Lake, a distance of 36 miles, for boats having a draft of from 4 to 5 feet.

The commerce of the harbor consists mainly of logs, lumber, farm products, pulp wood, and ties. It amounted to 334,551 short tons during 1911 and was valued at $2,714,856. A number of large lake passenger steamers stop at this port during the summer months.

On account of the progressive nature of the improvement the effect upon freight rates has been gradual, and the precise effect is therefore difficult of ascertainment, but there can be no doubt that during the season of navigation the existence of the deep-water harbor at Cheboygan has had a very decided effect on freight rates.

The funds estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to the completion of the 18-foot portion of the project up to the State Road Bridge, in order to make the improvement available for vessels trading to docks and dry dock in this section of the river.

Amount (estimated) required to be appropriated for completion of existing project	$14,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	14,000

FRANKFORT HARBOR, MICH.

This harbor is distant by water about 10 miles from Arcadia Harbor on the south and about 30 miles from the natural harbor of South Manitou on the north. In 1867, when the United States began work of improvement at this harbor, which is the entrance to Lake Aux Becs Scies, there existed an outlet about 750 feet north of the present channel, affording a depth of 3 to 4 feet and width of 70 to 80 feet between slab piers, built by local enterprise.

The project, adopted in 1866 and amended in 1868, 1879, and 1892, provided for a new outlet, with channel 12 feet deep and 200 feet wide, protected by piers and revetments. The estimated cost, revised in 1897 in compliance with the river and harbor act of June 3, 1896, to cover the cost of securing a channel 18 feet deep, was $413,659.85; further revised in 1899 to $421,938.35. The changes in the original project have been in effect merely extensions, so that the existing project does not differ in kind from the original one. All expenditures may therefore justly be regarded as pertaining to the present project.

To June 30, 1912, there had been expended the sum of $492,230.57, of which $351,353.59 was for construction and $140,876.98 for maintenance.

The approved project is completed and has resulted in the creation and maintenance of a channel 18 feet deep (about 20 feet below zero of gauge), whose natural depth, or depth to which the channel would probably shoal in a few years without dredging, is 12 feet, the width being 200 feet. It is protected by a north pier and revetment 2,000 feet long and a south pier and revetment 2,028 feet long, of which 116 linear feet at the inner end have been built by the United States Life-Saving Service to replace the ruined portion of the revetment, and of which 400 feet near the outer end were built by the Toledo & Ann Arbor Railroad Co. Dredging from time to time will be required to maintain the depths needed for navigation. The channel connects at the inner end with Lake Betsie (Aux Becs Scies), about 1½ miles long, 1,000 to 2,000 feet wide, and with generally shoal depths, except in the western portion where the depth is about 20 feet. The maximum draft that could be carried at the end of the fiscal year was about 18.5 feet (20 feet depth below zero of gauge).

Practically the entire commerce of this harbor is transacted by the car-ferry lines of the Ann Arbor Railroad, which has its northern terminus at this harbor. These car ferries run to Manitowoc, Kewaunee, and Marinette, Wis., and Manistique, Mich., upon the west shore of Lake Michigan, and form a highly important link in the through commerce between the Northwest and the Atlantic seaboard. The importance of maintaining adequate facilities at Frankfort Harbor is manifest. This can be done with certainty only by repeated dredging. Pier extension unaccompanied by thorough dredging will not serve.

The water-borne commerce at this port in 1911 amounted to 2,391 arrivals and departures, with 756,505 short tons of cargo, valued at $22,591,504, and for the most part general in character. The number of passengers carried in 1911 was 9,504.

The balance on hand is about $8,000, to be expended during the fiscal year ending June 30, 1913, and, in part, for the fiscal year ending June 30, 1914, for maintenance by dredging, repair of piers, and contingencies. For the fiscal year ending June 30, 1914, it is recommended that $3,000 be appropriated for maintenance by dredging, general repairs, and contingencies.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$3,000

HARBOR OF REFUGE AT GRAND MARAIS, MICH.

This harbor is situated on the south shore of Lake Superior, 313 miles east of Duluth and 90 miles west of Sault Ste. Marie. It is a deep-water bay, well protected from storms, having a length of 1½ miles, a width of three-eighths mile, an area of 240 acres, and a depth of 18 to 57 feet.

Originally the entrance to this harbor was obstructed by a bar having but 9 feet depth of water upon it at low water. The project for its improvement, submitted by a board of engineers, dated July 18, 1881, adopted by Secretary of War August 5, 1881, and modified December 21, 1894, has for its object a deep and safe channel into the harbor, making it a harbor of refuge. This object is to be attained by building parallel piers 500 feet apart, projecting into the lake to a depth of 22 feet, and dredging out an 18-foot channel between them, connecting the deep water of the lake with that of the harbor, and by closing up the natural entrance, 5,770 feet in width, by a solid pile dike, driven with a slope toward the waves and strongly braced. The proposed length of each pier was 1,800 feet. The estimated cost of the entire project was $484,000. The west pier has now reached a length of 1,912 feet, the east pier 1,545 feet, and the pile dike is completed.

This dike was built in 1895–1897 to close the natural entrance, to protect the harbor from storms, and to prevent the movement of sand into the harbor. The expected formation of a sand beach along the line of the dike is partially realized, but much of the dike is still exposed to the heavy seas and to damage by ice.

The amount expended on the project up to the close of the fiscal year ending June 30, 1912, not including outstanding liabilities, was $492,226.32, of which $136,341.03 was expended for maintenance.

The last dredging for the removal of shoals was done in June and will continue in progress in July, 1912; total contract cost, about $17,000. This will give a depth of 23 feet over the bar in the lake for the full width of the entrance, 500 feet, and a depth of 20 feet, with a width of 150 feet between the piers, and a greater width for a depth of 18 feet. The last previous dredging was in 1910. In August, 1911, repairs to the piers were made by riprapping the base of some of the cribs and refilling pockets with ballast, at a contract cost of $3,729. Some other repairs were made at a cost of less than $100.

The original project, with its modifications, is about 75 per cent completed, but it is possible that the work will be left in its present shape if the project for maintenance in its present condition proves satisfactory. The commerce is declining with the exhaustion of the pine timber, but the harbor is very useful for refuge purposes, it being the only harbor in a 90-mile stretch along a coast much subject to shipwrecks.

The annual expenses of Government operations at this harbor, consisting of maintenance, interest, and depreciation, is, approximately, $25,484.66. This amounts to $1.80 per ton of vessel freight for the year 1911 and to about 4⅗ per cent of the value of this freight.

Effect of project on freight rates: Since October, 1910, there have been no rail connections at this harbor on account of the discontinuance of the operation of the Manistique Railway, a logging road. The only means of transportation at present is by water, and for this reason no comparison can be made with railroad charges.

In front of the entrance to the harbor the 22-foot curve of depth had in 1909 advanced lakeward between 500 and 600 feet since the project for improvement was adopted, and this fact will entail some additional expense for pier extension to deep water. This would require an addition of 450 feet to the west pier and 794 feet to the east pier, and would bring the total cost of these extensions up to $149,280—about $103,879 more than the original estimate.

Further consideration of existing conditions leads to the conclusion that possibly the project depth of 18 feet may be as efficiently and more economically maintained by dredging alone than by further extension of the piers.

The commerce of this port has increased from 1,910 short tons in 1887 to 1,769 arrivals and clearances, with 54,525 short tons of freight, valued at $2,539,780, in 1907. This was the maximum year for value. In 1911 there were 858 arrivals and clearances, with 13,600 short tons, valued at $554,580, showing a decrease of 30 per cent in freight and an increase of 3 per cent in valuation from 1910.

The total commerce from 1880 to 1911, inclusive, is estimated at 1,505,210 short tons, valued at $26,654,226.

The total expenditures by the Government for this harbor to date are less than 2 per cent of the value of the vessel freight received and shipped during the period covered by these expenditures.

It is proposed to expend the amount estimated as a profitable expenditure for the year ending June 30, 1914, in dredging for the removal of shoals, repairs to piers, and general maintenance.

Amount (estimated) required to be appropriated for completion of existing project	$45,401.68
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	20,000.00

LUDINGTON HARBOR, MICH.

This harbor is the outlet of Pere Marquette River, which expands into Pere Marquette Lake before emptying into Lake Michigan, and by water is about 11½ miles from Pentwater Harbor on the south and 24 miles from Manistee Harbor on the north. In 1867, before improvement was begun by the United States, the outlet from Pere Marquette Lake to Lake Michigan had a length of 830 feet, protected by diverging slab piers. The entering depth was 7 to 8 feet.

The former project was adopted in 1867 and modified in 1885, 1889, 1890, and 1899. In its final form, as adopted by the river and harbor act of March 3, 1899, it provided for a through channel 183 to 285 feet wide and 18 feet deep, protected by the requisite piers and revetments. The estimated amount required to complete the revised project was $210,000. The development of the harbor has been progressive, the changes in the original project affecting only the length of the piers, their direction and the depth between them. It may therefore be said that the estimated cost of completion of that project is really the sum of the above amount and that previously expended, or $591,055.91 in all. The total amount expended upon that project was $617,867.72, of which $491,416.22 was for construction and $126,451.50 for maintenance, to July 1, 1907.

The present project, as adopted by the act of Congress of March 2, 1907, provides for an interior channel 18 feet deep, protected by piers and revetments, and for an exterior basin, to be formed by two breakwaters, each 1,800 feet long, 400 feet apart at the outer ends and diverging at an angle of 90°, the inner ends of the breakwaters to be connected with the shore by suitable structures, for the removal of the lakeward ends of the two inside piers, and for dredging an area in the basin after the removal of the ends of the inside piers. The estimated cost of this project was $839,087. A continuing contract for the construction of the breakwaters, not including the shore connections, was entered into under date of December 10, 1907, and completed May 18, 1911, the remaining work to be placed under contract at a later date.

Soundings of May 31, 1912, showed available depths, below zero of gauge, of 20.5 feet in the entrance basin and 20 feet between the inside piers.

The amount expended under the present project from July 1, 1907, to June 30, 1912, was $754,875.48, of which $725,381.27 was for new work and $29,494.21 for maintenance.

The sum of $19,076.98 was expended to settle claim made by the contractor for damage to the south breakwater. (Annual Report of 1911, p. 875.)

The existing project gave authority for entering into continuing contracts to complete the improvement at a cost not to exceed $839,087, which amount has been appropriated. It was necessary to increase the estimated cost of the project by $51,500 on account of additional riprap and stone filling made necessary by settlement of same during the time of construction, and this amount was appropriated by the river and harbor act of July 25, 1912.

The original project for the interior harbor is completed. The proportion of the project of 1907 completed, to June 30, 1912, is 81 per cent. The maximum draft that could be carried at the end of the fiscal year was about 18.5 feet, the depth of channel being 20 feet below zero of gauge. There now exists a reasonably reliable 18-foot channel, protected by piers and revetments. Annual dredging is necessary, however, to maintain a channel 18 feet in depth and of sufficient width. The lengths of the harbor structures are as follows: North breakwater, 1,800 feet; south breakwater, 1,800 feet; interior channel, north pier and revetment, 2,440 feet, and south pier and revetment, 2,481 feet. The width of the breakwater entrance is 400 feet and the width between the piers 273 feet at the outer end, narrowing to 183 feet at the inner end, which connects with Pere Marquette Lake about 2 miles long, one-half mile wide, and 20 feet to 40 feet deep.

The water-borne commerce at this harbor for 1911 consisted of 5,658 arrivals and departures, with 1,865,272 short tons of cargo, valued at $108,564,055, and was general in character. The number of passengers carried in 1911 was 43,653. The local freight rates by vessel to Chicago are about 27 per cent less than the corresponding rates by railroad.

This harbor is one terminus of the main line of the Pere Marquette Railroad Co., which operates lines of car ferries from this point to Manitowoc, Wis., and Milwaukee, Wis. Lines of passenger and package freight steamers also make regular sailings to Milwaukee, Chicago, and east-shore harbors to the north. The business done by the car-ferry lines is of large and constantly increasing importance in its effect upon freight rates to and from the Northwest. The effect of the improvement has been to create a class of traffic which, in the absence of a deep and readily available channel, could never have existed. There has thus been provided a shorter route for the products of the upper Mississippi Valley, which has the additional merit of avoiding the congestion usually existing on the railroads at the south end of Lake Michigan. Freight rates are believed to have been materially reduced by this route.

The balance on hand for new construction is about $14,000, and the expenditure of this, together with the $51,500 appropriated by the river and harbor act of 1912, has been authorized for the completion of the breakwater project. This work is under contract, except dredging an area in the basin after the removal of the lakeward ends of the inside piers, and if additional appropriation is required for this dredging an estimate will be submitted at a later date.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

MANISTEE HARBOR, MICH.

This harbor is distant by water about 24 miles from Ludington Harbor on the south and 8 miles from Portage Lake Harbor on the north. In 1866, previous to the beginning of work by the United States, the entrance to this harbor was improved by slab piers, 100 to 150 feet apart, built by local enterprise, a navigable depth of 7 to 8 feet being thereby maintained.

The project adopted in 1867 and amended in 1871, 1873, 1875, 1884, 1890, and 1892, provides for a channel of navigable width with a depth of 15 feet, extending from Lake Michigan to Manistee Lake, protected by piers and revetments at the entrance. The various modifications of the original project merely extended its limits, changed the proposed length of the piers, and the proposed depth from 12 to 15 feet.

The act approved March 2, 1907, changed the project by providing for improvement in accordance with the report submitted in House Document No. 511, Fifty-ninth Congress, first session, which contemplates securing a uniform depth of 18 feet, by dredging to a depth of 20 feet, pier extension, revetment, and protection works, at an estimated cost of $147,488, provided satisfactory pledge is given that certain private and municipal work will be completed within a reasonable time, that land for the improvement will be donated, and that the United States will be protected from claims for damages which may result from the work. The pledges required by the act of March 2, 1907, were not given, and the river and harbor act of June 25, 1910, again modified the project by providing for dredging a channel 18 feet in depth at low water between the piers and 16 feet in depth through the river to Manistee Lake, without any limiting requirements, in accordance with plan submitted in House Document No. 705, Sixty-first Congress, second session. The estimated cost of this dredging was $25,000.

The river and harbor act approved July 25, 1912, adopted a new project, in accordance with report printed in House Document No. 599, Sixty-second Congress, second session, which contemplates providing an enlarged harbor entrance to include (*a*) the construction of a south breakwater 1,300 feet long, with shore connection about 1,200 feet long, removal of 450 feet of the lakeward end of south pier, and dredging an entrance basin and the channel between the piers to a depth of 20 feet below low water; (*b*) dredging Manistee River from the inner end of the north pier to Manistee Lake to a depth of 18 feet below low water; (*c*) the extension of the north pier 200 feet (if required); and (*d*) the maintenance of the project. The estimated cost is $456,000 for first construction and $6,000 annually for maintenance, and is made contingent upon the donation, without cost to the United States, of a strip of land at the shore line at least 200 feet wide, 100 feet on each side of the center line of the shore connection of the breakwater, and 200 feet long, to insure free access to the pier and full control of the same.

Soundings completed May 3, 1912, showed available depths below zero of gauge of 21.4 feet on the entrance bar, 18.2 feet between the piers, and 15 feet in the river.

To June 30, 1912, there had been expended $499,134.83, of which $351,196.67 was for construction and $147,938.16 for maintenance.

The original project is completed with the exception of 100 feet extension of the south pier, and this is canceled with the adoption of the new project in the river and harbor act of 1912. The project modification of the act of June 25, 1910, is completed with the exception of the dredging between the piers, which is now under contract.

As a result of the above total expenditure to June 30, 1912, there had been built 2,906 linear feet of north and 1,450 linear feet of south pier and revetment, the width between the piers varying between 150 feet inside and 190 feet at the outer end of the south pier, which is 250 feet shorter than the north pier. The portion of the north revetment occupied by the Manistee & Northeastern Railroad Co., referred to in the Annual Report of the Chief of Engineers for 1899, page 2940, still remains without repairs. The outer end of the north pier has been badly damaged by a colliding vessel and by storms and needs repairs. Navigation extends to the head of Manistee Lake, which is about 4 miles long, ¼ to ½ mile wide, and over 30 feet deep. The maximum draft that could be carried at the end of the fiscal year was about 16.5 feet (18 feet below zero of gauge) in the river.

The vessel commerce at this port in 1911 amounted to 1,618 arrivals and departures, with 320,820 short tons of cargo valued at $3,763,626, principally local in character. The number of passengers carried in 1911 was 29,359. Definite information as to the effect of the improvement upon freight rates could not be obtained, but the local freight rates by vessels from Manistee to Chicago are about 30 per cent less than the corresponding rates by railroad.

The commerce tributary to this harbor is derived principally from the salt and lumber industries. The harbor is also a regular port of call for one line of steamers plying from Chicago to points upon the east shore of Lake Michigan, and a single steamer makes stated trips from Manistee to Milwaukee. There are three railroads running into Manistee—the Pere Marquette, the Manistee & Grand Rapids, and the Manistee & Northeastern.

The river and harbor act of 1912 appropriates $150,000 for an enlarged harbor entrance in accordance with the new project, which it is estimated will provide for the construction of about 700 feet of the breakwater. The remainder of the breakwater, the removal of the inside pier, and the shore connection must be let in one contract, as portions of the pier are to be used in the other two structures. It is recommended, therefore, that prior to June 30, 1914, there be appropriated for this purpose $240,000, which is the balance of the estimated cost of this portion of the project.

The balance available from previous appropriations for maintenance is about $12,000, which will probably be sufficient to June 30, 1913, provided no unusual contingencies arise. For the year ending June 30, 1914, for maintenance by dredging, general repairs, and for contingencies, it is recommended that $6,000 be appropriated.

Amount (estimated) required to be appropriated for completion of existing project	$306,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	246,000

HARBOR OF REFUGE, MARQUETTE BAY, MICH.

Marquette Bay, also known as Presque Isle Harbor, is a small bay within the city limits of Marquette, north of Marquette Harbor, and distant 3 miles therefrom.

The bay is about 1½ miles long and extends into the shore about one-half mile. The natural depth over the greater part of this area was from 18 to 20 feet at low water, and dredging by the United States has not been considered necessary.

Before improvement the locality was fully exposed to storms from the east and northeast, and comparatively little shipping was done.

A resolution of Congress, approved March 20, 1896, directed the Secretary of War to make a survey and submit an estimate for a breakwater in this bay. The results of this survey, with estimates amounting to $20,000 for a breakwater 500 feet long and $50,000 for construction of one 1,000 feet long, are published in House Document No. 318, Fifty-fourth Congress, first session.

The project adopted by the act of June 3, 1896, is to build a breakwater 1,000 feet in length off Presque Isle Point.

This breakwater was built to its full length in the years 1897–1900.

The act of Congress approved June 13, 1902, provided that a portion of the appropriation for Marquette Harbor "not exceeding seven thousand five hundred dollars may be expended in connecting the Presque Isle breakwater with the shore."

Under this provision the gap between the breakwater and shore was closed, in the fall of 1902, by a timber pier 216 feet long, and 100 linear feet of shore revetment constructed.

The existing project with modifications is to build a breakwater 1,000 feet in length off Presque Isle Point and for connecting this breakwater with the shore. Estimated cost, $57,500.

The project has been completed.

No additional work is proposed except for maintenance.

The total amount expended on the project up to the close of the fiscal year ending June 30, 1912, not including outstanding liabilities, was $57,858.74, of which $2,802.40 was expended for maintenance.

The work done has enabled vessels to lie at the ore pier and other docks in the vicinity in ordinary weather and moderate storms, and shipping has increased greatly.

This harbor is largely used for commercial purposes, but not as a harbor of refuge.

Vessels drawing 19 feet can reach the ore pier at mean low water.

The usual variation of water level extends from 0 to +1 foot above low-water datum, this plane of reference being a mean low-water level. It is referred to permanent bench marks.

The lake commerce of this port in 1897 amounted to 1,100 arrivals and departures, with 1,095,243 short tons of freight. In 1911 the lake commerce amounted to 344 arrivals and departures, with 1,017,174 short tons of freight, valued at $3,561,320.

The total commerce from 1897 to 1911, inclusive, is estimated at 23,180,547 short tons, valued at $64,865,434.

The total expenditures by the Government for this harbor to date are one-eleventh of 1 per cent of the value of the vessel freight received and shipped during the period covered by these expenditures.

The annual expense of Government operations at this harbor, consisting of maintenance, interest, and depreciation, is approximately $3,479. This amounts to 3 mills per ton of vessel freight for the year 1911 to less than one-tenth of 1 per cent of the value of this freight, and is one-sixth of 1 per cent of the saving in the cost of transportation on this freight by water as compared with rails rates. (See table 4, Appendix I I 9, of this report.)

Effect of project on freight rates: The saving in cost of transportation by water of 1911 freight over the cost by rail, at the estimated figure of $1.92 per ton, as in table 4 of this report, amounts to $1,952,974.

This was made practicable by the Government breakwater at this locality. This harbor, as already stated, is not used for purposes of refuge, and it may be questioned whether its freight business could not have been transacted at Marquette, only 3 miles distant, where the Government had already constructed a harbor.

It is proposed to expend the available balance, and the appropriation recommended, on repairs to the breakwater and for general maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

HARBOR AT ONTONAGON, MICH.

Situated on the south shore of Lake Superior, 144 miles east of Duluth, this harbor is formed by the improvement of the mouth of the river of the same name. About one-half mile of the river is used for commercial purposes. Two parallel timber piers, one-half mile long and 250 feet apart, with dredging between them to a depth of 15 feet, form the entrance. The natural entrance had but 6 or 7 feet depth in 1867, at which time Congress, by making an appropriation in the act of March 2, 1867, provided for the improvement of this harbor, and the project for securing 12 feet depth by building parallel piers on either side of the mouth, extending to the 18-foot curve of depth in Lake Superior, and dredging a channel between the piers was adopted; estimated cost, $363,770. The west pier was built to a length of 2,675 feet and the east pier to a length of 2,315 feet. This brought the outer end of the west pier very nearly to the 18-foot curve of depth, as proposed.

The original project was completed in 1889, and since then up to 1910 expenditures have been only for keeping a 12-foot channel open by dredging and for the repairs to the piers.

The amount expended on original project is $398,017.98, of which sum $113,216.74 has been spent for maintenance of the improvements.

Congress by act of June 25, 1910, authorized further improvement of this harbor by the so-called "smaller plan" reported in House Document No. 602, Sixty-first Congress, second session, which provides for a channel 150 feet wide and 17 feet deep at low water in the lake, 100 feet wide and 15 feet deep between the piers, and two short channels 75 feet wide and 15 feet deep leading from the inner end of the piers to the nearest end of the principal wharves on each side of the harbor, at an estimated cost of $15,400, with $8,000 annually for maintenance and an additional $1,000 annually for the maintenance of the piers.

The amount expended on the last-named project to June 30, 1912, is $9,560.10, of which $5,300.10 was for maintenance.

The existing project with modifications provides for a channel 150 feet wide and 17 feet deep at low water in the lake, 100 feet wide and 15 feet deep between the piers, and two short channels 75 feet wide and 15 feet deep leading from the inner end of the piers to the nearest end of the principal wharves on each side of the harbor, these depths to be secured by building parallel piers on either side of the mouth, extending to the 18-foot depth in Lake Superior and by dredging. Estimated cost, $379,170.

Operations for the fiscal year consisted in dredging the entrance channels for improvement to the extent of 21,074 yards at 11½ cents, $2,423.51, exclusive of administration; 16,820 yards for maintenance by the removal of shoals, June, 1912, at 22 cents, $3,700.40; and repairing piers, $2,745, making a total of $8,865.

The improvement contemplated under the last modification of the project authorized June 25, 1910, is about 90 per cent completed, and for about one-third of the estimated cost. This difference is owing to the absence of expected shoaling (see H. R. Doc. 602, 61st Cong., 2d sess., p. 14) and to an abnormally low price for dredging (11 cents) under sharp competition.

The proportion of the entire approved project accomplished up to June 30, 1912, is more than 99 per cent. But little remains now except maintenance.

The maximum draft that can be carried June 30, 1912, at low-water datum over the shoalest part of the locality under improvement is about 8 feet. Dredging in progress, however, has given an available depth of 15 to 17 feet for a partial width of the projected channel.

In 1867 there were 449 arrivals and departures, with 5,000 short tons of cargo, and in 1911 there were 404 arrivals and departures, with 21,266 short tons of cargo, valued at $245,956.

The commerce of this port since the commencement of operations by the United States is estimated at 1,028,441 short tons, valued at $49,845,487.

The amount of freight received and shipped in 1911 was 3 per cent less than in 1910, and in value of freight it was 22 per cent less than in 1910.

The total expenditures by the Government for this harbor to date are about four-fifths of 1 per cent of the value of the vessel freight received and shipped during the period covered by these expenditures.

The annual expense of Government operations at this harbor, consisting of maintenance, interest, and depreciation, is approximately $19,920. This amounts to 94 cents per ton of vessel freight for the year 1911 and to 8 per cent of the value of this freight, and is 49 per cent of the saving in the cost of transportation on this freight by water as compared with rail rates.

Effect of project on freight rates: The estimated saving in cost of transportation by water over that by rail is $1.92 per ton, or $40,831 for the lake commerce of this port in 1911. As the former condition of the river was unsuited to navigation, this saving in freight rates may be considered as effected by the United States improvements.

The amount recommended for expenditure in fiscal year ending June 30, 1914, will be applied to the removal of shoals, repairs to piers, and to general maintenance, the work proposed being necessary to make the improvement available.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$9,000.00

ST. JOSEPH HARBOR AND RIVER, MICH.

These were formerly carried as separate works, but are now combined in consequence of a provision in the river and harbor act of June 13, 1902.

(*a*) *St. Joseph Harbor.*—This harbor is formed by the junction of the St. Joseph and Paw Paw Rivers and extends along the city front of St. Joseph, and in its original condition had a natural width of 800 feet, which has been reduced to 300 feet by wharves built upon the approved harbor lines. Michigan City, the nearest harbor to the south, is distant about 35 miles by water, and South Haven, the nearest harbor to the northeast, is distant about 23 miles; Chicago is distant about 60 miles. It has been under improvement by the United States since 1836, previous to which time there was a narrow and crooked channel with depths which varied from 3 to 7 feet. In all, there was expended upon the various projects previous to the present $503,113.23.

The river and harbor act of March 3, 1899, adopted the present project. This project, which has not been modified, provides for an entrance channel 18 feet deep and for an interior channel 18 feet deep and 150 feet wide along the city front of St. Joseph, while the Benton Harbor Canal and the turning basin at the mouth of the St. Joseph River were to be dredged to 15 feet, the north pier extended 1,000 feet, and the south pier, upon a line parallel with the north pier, 1,800 feet. The width was to be 330 feet at the entrance, narrowing to 257 feet inside. The estimated cost of completion of the existing project was given in the above report at $380,000.

Up to June 30, 1912, there has been expended upon the existing project $398,516.68, of which $95,423.30 was applied to maintenance.

All new construction work and dredging to the proposed depth and width under the approved project have been completed, and present operations are confined to maintenance.

The north pier and revetments measure 2,854 feet, 2,183.5 feet being cribwork and 670.5 feet pilework; at the east end a wing 165 feet long connects it with the dock of the United States lighthouse depot. The south pier is 2,603 feet long, 1,780 feet being cribwork and 820 feet pilework. These structures are in fair condition, except the 165 feet of wing at east end of north pier and the superstructure over the inner portions of the pilework, which is becoming decayed.

The completion of the approved project has resulted in a thorough channel of largely increased width, depth, and general availability. The channel is, however, subject to deterioration due to sand brought down by the St. Joseph and Paw Paw Rivers during the annual floods, and has required and will continue to require repeated dredging for its maintenance. The available depths on June 30, 1912, were as follows: In the outer approach, not known; between the piers, 18 feet; in interior harbor from the inner end of the piers to mouth of Benton Harbor Canal, 16 feet; and in Benton Harbor Canal, 16 feet.

The lake commerce during 1911 amounted to 183,163 short tons, valued at $14,403,248, of which about 70 per cent was local and 30 per cent through traffic. The total number of passengers carried was 281,842, and the number of vessel arrivals and departures was 1,316.

The principal traffic benefited by this improvement is the transportation of manufactured products, the fruit traffic, and the carrying of passengers, including excursionists. One line of steamers, during the summer, runs from two to four boats daily, and another line makes daily trips across the lake. The vessel freight rates to Chicago are about 14 per cent less than the corresponding railroad rates.

The balance on hand is about $1,200. This, together with the $15,000 appropriated by the river and harbor act approved July 25, 1912, will be expended during the fiscal year ending June 30, 1913, for maintenance by dredging, general repairs, and contingencies. It is recommended that $5,000 be appropriated for the fiscal year ending June 30, 1914, for maintenance by dredging, for general repairs, and for contingencies.

(*b*) *St. Joseph River.*—This is a crooked stream, obstructed by numerous shoals, with depth in channel crossings of from 24 to 30 inches. The intervening pools are generally from 4 to 8 feet deep. The part under improvement has been from the mouth at St. Joseph to Berrien Springs, a distance of about 22 miles by river. The improvement of this section to make a low-water channel 3 feet deep has been in progress since 1889, and consists in removing snags and logs and closing secondary channels, and in concentrating the flow at critical points by dams of brush, logs, and stone.

The amount expended to June 30, 1912, was $6,985.88, of which $4,555.49 was for construction and $2,430.39 for maintenance, as a result of which many of the worst places of the stream had been improved in a temporary way from year to year. The amount of work done in recent years has been small.

During the fiscal year a temporary dam was built about mile 3 (above the mouth of the river) to close a secondary channel, and a wing dam was built about mile 6 to concentrate the flow; some snags and leaning trees were also removed.

The traffic benefited is becoming smaller year by year, and during recent low-water seasons has been confined mostly to the lower 6 miles of the river. The boats using the river are shallow-draft gasoline launches carrying resort passengers. No freight was carried in 1911 and no statement has been received of the number of passengers carried.

The balance on hand is about $280, and the river and harbor act of July 25, 1912, contains an appropriation of $500 for maintenance. For the fiscal year ending June 30, 1914, the sum of $1,000 is recommended to be appropriated for general maintenance of the channel.

CONSOLIDATED.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$6,000

HARBOR AT SAUGATUCK AND KALAMAZOO RIVER, MICH.

The harbor is about 19 miles by water from South Haven Harbor on the south and about 7 miles from Holland Harbor on the north. Before the work of improvement was begun by the United States, in 1869, this harbor, which is at the mouth of Kalamazoo River, had been improved by local enterprise by the construction of slab piers 200 feet apart, the north pier being 500 feet long and the south pier 1,575 feet. The channel depth varied from 5 to 7 feet. The project for the old harbor at the mouth of the river was adopted in 1867 and amended in 1869, 1875, and 1882. At the old harbor there is a north pier 715 feet long, which is entirely unserviceable; separated from the pier by a long stretch of unprotected bank there is a north revetment, partly destroyed and partly covered by sand. The south pier is 3,863 feet long and is practically ruined. Frequent dredging was required for maintenance of an 8-foot channel. Appropriations after 1882 were too small to keep the piers in proper repair. To June 30, 1906, $207,785.92 had been expended, of which $90,231.99 was for construction and $117,553.93 for maintenance, and as no further expenditures would be made on old harbor, the balance unexpended July 1, 1906, $9,453.08, was diverted to improvement of new harbor. At the present time both ends of the old channel are entirely filled with sand.

The project for the new harbor was adopted by the river and harbor act of June 3, 1896. It provides for creating a channel of 12 feet depth and navigable width by dredging the river for a distance of 1¾ miles below Saugatuck, and thence making a new cut from the river to the lake, entering the latter about 3,700 feet north of the original mouth at the old piers. The original estimate for the work was $150,000, but authority was granted on May 31, 1900, to increase this to $250,000. The river and harbor act of March 2, 1907, authorizes the maintenance of a harbor channel of sufficient depth to allow the free use of the Government dredge *General Meade*, viz, 16 feet below zero of gauge.

The project was modified by the river and harbor act of June 25, 1910, in accordance with the report printed in House Document No. 635, Sixty-first Congress, second session, so as to provide for dredging a channel from the inner ends of the piers to Saugatuck to a depth of 16 feet below zero of gauge and a width of about 90 feet, at an estimated cost of $36,000, and to maintain the whole improvement for a period of five years after the 16-foot channel has been obtained, the desirability of continuing or abandoning the harbor to be then determined.

During the fiscal year the following work was done: For new construction the two contracts were completed November 8, 1911, (*a*) for removing the shoal and the projecting point on the left bank of the river near the inner ends of the piers, and (*b*) for continuing this channel to the town of Saugatuck; the depth in each contract was 16 feet below zero of gauge, to produce 14 feet during the navigation season, and the width 90 feet, except near the inner end of the piers, where it widened to about 250 feet. This completes the construction work of the approved project.

For maintenance the *Meade* dredged the entrance bar in Lake Michigan and the channel between the piers July 5–19, 1911, with resulting depths below zero of 18 feet and 17 feet, respectively.

To June 30, 1912, $331,238.30 had been expended under the existing project, $274,294.80 for construction, and $56,943.50 for maintenance.

The pier and revetment construction and the dredging provided for by the approved project have been completed; further operations will be confined to maintenance of the whole improvement for a period of five years from November, 1911.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$3,000

SOUTH HAVEN HARBOR, MICH.

This harbor is situated at the mouth of Black River, about 23 miles by water from St. Joseph Harbor on the south and 19 miles from Saugatuck Harbor on the north. Improvements were begun in 1867, at which time there existed a channel 7 feet deep and 85 feet wide between slab piers. These piers had been built by residents of the vicinity at a cost of about $18,000. The banks of the river for 500 feet on each side had a rough protection of close piling.

The project of 1866, as modified in 1869, 1872, and 1888, provided for constructing parallel piers and revetments 175 feet apart at the mouth of Black River, with the object of procuring a channel 12 feet deep and extending the navigable channel one-half mile up Black River to the highway bridge by dredging.

The act approved March 3, 1905, adopted a project for pier extension and dredging a channel 16 feet deep and 120 feet wide between the piers, and 90 feet wide above them, at an estimated cost of $279,370, and $10,000 annually for maintenance.

The existing project provides for establishment of dock lines and building of bulkheads along such lines by local interests; for an available depth of channel of 16 feet at all stages; for repairs to present piers so as to permit the deeper dredging; for extension of each pier 800 feet, a total of 1,600 feet of pierwork; and for maintenance by dredging and by repair of existing structures.

The total expenditure to June 30, 1912, was $437,942.73, of which $240,287.06 was expended for construction and $187,655.67 for maintenance.

The contract for pier extension, referred to above, was entered into under the continuing-contract authorization of the river and harbor act of February 27, 1911 (see Annual Report, 1911, p. 860). The amount available for this work is $20,000. The sundry civil act of August 24, 1912, appropriated $40,000, and it is expected that the balance will be appropriated for in the next sundry civil bill, about March, 1913. The continuing-contract authorization is $198,000, of which $158,000 is yet to be appropriated.

To June 30, 1912, the approved project has been completed with the exception of the last two items named above, viz, the pier extension and the maintenance by dredging and maintenance of existing structures. The available depths below zero of gauge June 30, 1912, were 20 feet on the entrance bar in Lake Michigan and in the channel between the piers and 18 feet in the river.

The water-borne commerce at this port is about 73 per cent local and 27 per cent through traffic. In 1911 there were 538 vessel arrivals and departures, with 19,244 short tons of cargo, with an estimated value of $1,269,423. The total number of passengers carried in 1911 was 150,326. Vessel freight rates to and from Chicago are 27 per cent less than the corresponding railroad rates.

The balance available from previous appropriations after reserving $20,000 for payments under the contract for pier extension is about $6,900, and this, together with $3,000 in the river and harbor act of July 25, 1912, will be used as may be needed during the fiscal year ending June 30, 1913, for maintenance of the channel, for repairs to piers, and for contingencies. For the fiscal year ending June 30, 1914, it is recommended that $3,000 be appropriated for maintenance.

The present contract for pier extension was entered into under the continuing-contract authorization of the river and harbor act of February 27, 1911. The amount available for this work is $60,000, including the $40,000 appropriated by the sundry civil act of August 24, 1912, and it is expected that the balance for this contract, $43,000, will be provided for in the next following sundry civil bill, about March, 1913, as the time allowed for this contract expires June 6, 1914. As the contract was let subject to these conditions as to funds, it is recommended that appropriations be made in accordance with the above plan.

Amount (estimated) required to be appropriated for completion of existing projects	$158,000
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	43,000
For maintenance of improvement	3,000
Total	46,000

DETROIT RIVER, MICH.

The Detroit River flows from Lake St. Clair into Lake Erie, generally in a southerly direction, and its length is about 31 miles from Windmill Point Lighthouse at Lake St. Clair to Detroit River Lighthouse at Lake Erie. Before improvement the shoalest part of the channel was at Limekiln Crossing, about 8 miles above Detroit River Lighthouse, where the normal depth was from 12½ to 15 feet (at a Lake Erie stage of 571 feet above mean tide at New York) over a bottom of solid rock. The water surface, usually changing slowly, may rise or fall from a few inches during many days of calm weather to about 4 feet during severe storms and to about 6 feet during short severe hurricanes, and the monthly mean may change as much as 2 feet in one year or 4 feet in 40 years. The project covers the river from deep water in Lake Erie to the city of Detroit, a distance of about 24½ miles, of which about 3 miles are in Lake Erie beyond Detroit River Lighthouse.

The first project of 1874 provided for a winding channel at Limekiln Crossing of at least 20 feet in depth, over about 3,000 feet in length and 300 feet width; modified in 1883 so as to somewhat straighten such channel; in 1886 to give 400 feet width; and in 1888 to give 440 feet width. The general depth above and below the Limekiln was 20 feet or more, but the bed of the river was studded with large bowlders and rocky shoals, which limited the safe navigable depth to scant 15 feet through a distance of about 12 miles. The project was modified and extended in 1892 so as to provide for the removal of all obstructive shoals between the city of Detroit and Lake Erie, with a view to obtaining a through channel with a least width of 600 feet and a navigable depth of 20 feet, at a total estimated cost of $1,554,500, as adopted by river and harbor acts of July 13, 1892, and March 3, 1899, and as approved by the War Department at various dates from 1892 up to July 3, 1899. There has been expended on previous projects and modifications thereof $1,554,500.

The present project was adopted by the river and harbor act of June 13, 1902, which provides for a channel 600 feet wide and 21 feet deep from Detroit to Lake Erie. The estimate for the work was increased (see the final report of the survey directed by the act of Mar. 3, 1899, in Annual Report of the Chief of Engineers for 1905, pp. 2292–2296) to $3,750,000, and in accordance with this increase the river and harbor acts of March 3, 1905, and March 2, 1907, authorized the continuation of the improvement to the extent of $700,000 in addition to the $1,750,000 originally authorized. All of this money has been appropriated, but there still remains to be provided for the work $365,000. On November 12, 1904, this project was modified to permit of slightly shifting the location of the proposed channel at Bar Point Shoals, mouth of Detroit River, without increasing the cost.

The river and harbor act of March 2, 1907, modified the present project so as to provide for two channels—one for downbound, the other for upbound vessels, past Bois Blanc Island—in accordance with House Document No. 266 (map), Fifty-ninth Congress, second session (see Annual Report of the Chief of Engineers for 1907, p. 698). The second channel, called the Livingstone Channel (plan B of the report on survey), is to have a least width of 300 feet out to Bar Point, and 800 feet thence to deep water in Lake Erie, with a least depth of 22 feet. This act appropriated $2,000,000 for work on this channel and authorized continuing contracts to the extent of $4,670,950 additional, of which $345,950 has not been appropriated and will not be needed.

The river and harbor act of June 25, 1910, further modified the project of June 13, 1902, so as to provide 22 feet depth north of the junction with Livingstone Channel, and appropriated for this work $560,000. This act also modified the project of March 2, 1907, so as to provide 450 feet width in Livingstone Channel within the cofferdams at Stony Island, in accordance with House Document No. 676, Sixty-first Congress, second session.

The existing project as modified provides for a channel at least 600 feet wide from Detroit to Lake Erie and 22 feet deep (below a Lake Erie stage of 571 feet) north of the junction with Livingstone Channel and 21 feet deep south of said junction, and for a second channel, known as Livingstone Channel, at the mouth of Detroit River to be 22 feet deep, and 300 feet wide from Grosse Ile to Bar Point, and 800 feet wide, thence to deep water in Lake Erie, except for a length of 5,600 feet at Stony Island, which is to be 450 feet wide.

During the fiscal year work has been prosecuted under nine contracts and by hired labor at Ballards Reef, in the Amherstburg Channel, and under two separate contracts in the Livingstone Channel. About 85 per cent of the work of improving the Amherstburg Channel has been completed and 98 in the Livingstone Channel.

There has been expended to June 30, 1912, on the channel now designated as plan A, $4,374,563.34, of which amount $2,820,063.34 was applied to the present project, adopted in 1902. The amount expended for Livingstone Channel is $6,397,110.21. None of these funds have been applied to maintenance. The project for improving the channel via Amherstburg is now practically completed, except along Ballards Reef and the channel west of Detroit River Lighthouse to deep water in Lake Erie. The improvement along Ballards Reef north of the junction with Livingstone Channel to 22 feet depth is in progress, and that south of this junction will be commenced soon after the opening of Livingstone Channel to navigation. For this latter work $375,000 was appropriated by river and harbor act of February 27, 1911. There has been appropriated $6,955,000 for the Livingstone Channel. The minimum depth in the improved channel is at Ballards Reef, where, on June 30, 1912, there was a depth of 21.75 feet, but due to fluctuations in lake levels this is subject to change. At the mean monthly stage for November, 1911, there was a depth at this locality of 19.44 feet.

The condition of the Livingstone Channel work, on the four sections in which the work was originally divided for contracts, is as follows:

Section 1, of which joins at its upper end with Ballards Reef Channel, is entirely completed for the full project width of 300 feet and depth of 22 feet outside of cofferdam and width of 450 feet and depth of 23 feet within cofferdam. This will be completed about July 10, 1912, with the exception of the material underlying the north dam.

Section 2 is entirely completed for the full project width of 450 feet and depth of 23 feet within cofferdam and width of 300 feet and depth of 22 feet outside of cofferdam, with the exception of the material underlying the south dam. This will be completed about July 31, 1912.

Section 3 continues the channel for 300 feet width and 22 feet depth, and the contractors have about 96 per cent of the work completed.

Section 4, which widens to 800 feet with depth of 22 feet, is entirely completed.

It is expected that the entire channel will be completed and thrown open to navigation late in the season of 1912.

The amount estimated for profitable expenditure during the fiscal year ending June 30, 1914, will be applied to the completion of channel passing west of Detroit River Lighthouse from 400 to 600 feet width, in accordance with project of June 13, 1902, for plan A channel.

Amount of continuing contract authorization, act of Mar. 2, 1907	$4, 670, 950
Amount appropriated under such authorization	4, 325, 000
Amount yet to be appropriated	345, 950
Amount (estimated) required to be appropriated for completion of existing projects	365, 000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	365, 000

Following is letter of Chief of Engineers submitting report on survey printed in House Document No. 17, Sixty-second Congress, first session:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, April 14, 1911.

SIR: I have the honor to submit herewith, for transmission to Congress, reports dated September 7, 1910, and January 27, 1911 (with map), by Col. C. McD. Townsend, Corps of Engineers, on preliminary examination and survey, respectively, called for by the river and harbor act approved June 25, 1910, of Detroit River, Wyandotte Channel, lying between Fighting Island and the city of Wyandotte, Mich., with a view to straightening the channel.

When the work now under way below Fighting Island is completed there will exist, as there already exists in the river above, ample width and depth for purposes of navigation. But between Fighting Island and Wyandotte, for a distance of about 5 miles, the channel is somewhat crooked and its disadvantages are clearly explained by the district officer in his report dated September 7, 1910.

He presents an estimate for dredging off certain points in the bends to provide a straight channel 800 feet wide and 22 feet deep along the west side of Fighting Island at an estimated cost of $310,000. It is not believed that any maintenance work will be required and no estimate therefor is submitted.

In view of the existing congestion and enormous tonnage of boat travel along this route, I concur in the opinion of the district officer, who is now also the division engineer, and the Board of Engineers for Rivers and Harbors, that the expenditure of this amount is justified by the convenience to navigation which will result therefrom, and in the recommendation that this improvement be undertaken by the General Government. I am of the opinion that if the entire amount involved is not provided by a single appropriation, its completion should be provided for by contract authorization.

Very respectfully,

W. H. Bixby,
Chief of Engineers, United States Army.

The Secretary of War.

ROUGE RIVER, MICH.

The Rouge River rises in the northwestern part of Wayne County, flows in an easterly direction, and empties into the Detroit River at the southerly limits of the city of Detroit. The river is about 30 miles in length. The particular section included in the project is 4½ miles long. This stream originally had a channel depth of from 10 to 17 feet at 575 from its mouth to where the Wabash Railroad bridge crosses it, a distance of about 3 miles.

Under the provisions of the river and harbor act of August 5, 1886, a survey of the river was made and a project dated August 25, 1888, prepared for securing a channel depth of 16 feet with a width of 240 feet at the mouth, tapering to 100 feet at a distance of 800 feet from the mouth, and thence with a width of 100 feet to the Wabash Railroad bridge, the plane of reference being 575. The estimated cost was $31,690.39. The work of improvement was commenced in 1888 and completed in November, 1892, at a cost of $30,272.79.

The existing project provides for dredging a channel 21 feet deep from the mouth of the river to the first bridge, with a width of 240 feet at the mouth tapering to 100 feet at a distance of 800 feet from the mouth, a channel 16 feet deep and 100 feet wide from the first bridge to the Wabash Railroad bridge and a channel 13 feet deep (width not specified) thence to the Maples Road.

The amount expended on the work of the existing project to the close of the fiscal year ending June 30, 1912, is $76,352.67, of which $26,270.18 has been applied to maintenance.

The approved project has been completed, affording the depths and widths called for. The maximum draft that can be carried June 30, 1912, from the mouth to the Solvay Tunnel is 17 feet, from there to the Wabash Railroad bridge 13 feet, and 10 feet to Maples Road, at datum plane 575. The river is navigable for vessels of light draft to the town of Dearborn, 15 miles above the mouth.

The receipts and shipments by vessel during the year 1911 amounted to 951,309 short tons, of which 248,303 short tons were iron ore, 80,165 short tons lumber, 110,282 short tons oil, and 409,766 short tons gravel and sand. The value of this commerce is about $3,216,515.

As a result of the improvement the area available for manufacturing plants in the vicinity of Detroit has been greatly extended, and these plants have been enabled to receive the raw materials which they use without transfer or transshipment. As a consequence, the cost of the raw materials has been greatly reduced.

The effect of the improvement has been to reduce freight rates 30 to 50 per cent for firms actually using dockage on the river.

The amount estimated for the fiscal year 1914 will be applied to maintenance of channel.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$5,000

ST. MARYS RIVER AT THE FALLS, MICH.

The St. Marys River forms the outlet of Lake Superior, connecting it with Lake Huron. From Whitefish Bay, at Point Iroquois, the river flows in a general southeasterly direction to Lake Huron at Detour, a distance of from 63 to 75 miles, according to the route followed. The falls, or rapids, where the river falls about 20 feet in a distance of 1 mile, are located about 14 miles below Point Iroquois. The reach under improvement at the falls is about 2 miles long and from the lower end of the improvement to the outlet of the river at Detour is about 47 miles by way of the shortest navigation channel.

Commercial navigation of the falls, or rapids, of this river at Sault Ste. Marie was impracticable except for logs and very small craft, until 1855, when the State of Michigan built a canal providing a navigable channel for vessels having a draft of 11.5 feet at mean stage of water, at a cost of about $1,000,000, the proceeds of 750,000 acres of land granted by the United States Congress. This improvement, completed in 1855, provided a canal 5,700 feet long with available width of 64 feet and top width of 100 feet, with a double lift lock having tandem chambers 350 feet long and 70 feet wide, with gate openings of 70 feet, and arranged for an average lift of about 9 feet at each lock.

In 1870 the United States entered upon a project for increasing the width of the canal to at least 100 feet, replacing the stone slope walls with timber revetment piers, building a new lock, and providing for 16 feet draft. This lock (now known as the Weitzel Lock) was opened to traffic in 1881, its single chamber being 515 feet long and 80 feet wide, narrowed at gate openings to 60 feet and arranged for 18 feet average lift. The cost of the work from 1856 to 1885, inclusive, was $2,625,692, including $10,000 diverted from the 1864 Great Lakes appropriation. A rapidly increasing commerce developed as a result of these improvements.

The river and harbor act of August 5, 1886, authorized the execution of a project for building, on the site of the old State locks, a new lock with a single lift of 16 to 21 feet, the chamber being 800 feet long by 100 feet wide, with 21 feet depth on the miter sills at mean stage of water; also for deepening the canal and its approaches, all at an estimated cost of $4,738,865. The new lock, constructed under this project and known as the Poe Lock, was opened to navigation August 3, 1896. Later work consisted in completing the deepening of the canal and its approaches, rebuilding and extending canal piers, grading and improving canal grounds, etc.

The river and harbor act of June 13, 1902, authorized the following diversions from existing funds, namely, $20,000 for special improvement at Sailors Encampment, $20,000 for salaries and expenses of the International Waterways Commission, and $86,491.28, the amount required to complete certain improvements at St. Clair Flats Canal, for which existing funds pertaining to the latter work were insufficient. The act also provided for extending the work at the falls so as to include widening and further improvement of the canal above the locks, in accordance with the project submitted in House Document No. 128, Fifty-sixth Congress, second session, but made no additional appropriation therefor.

The river and harbor act of March 3, 1905, authorized the expenditure under continuing contract of $1,020,000, all of which has been appropriated, for widening canal as proposed in project submitted in House Document No. 215, Fifty-eighth Congress, third session.

The river and harbor act of March 2, 1907, adopted a project for the construction of a new lock, with a separate canal, in accordance with "plan 3," set forth in House Document No. 333, Fifty-ninth Congress, second session, at an estimated cost of $6,200,000. This project provides for a lock 1,350 feet long between gates, giving a usable length of not less than 1,300 feet, with least depth of 24.5 feet below extreme low water, and width of 80 feet, and a separate canal 260 to 300 feet in width. No modification has been made in the project for new lock and canal since its adoption in 1907.

The river and harbor act of July 25, 1912, adopted a project for the construction of a fourth lock, in accordance with the report submitted in House Document No. 64, Sixty-second Congress, first session, at an estimated cost of $3,275,000. This report provides for a lock of the same dimensions as the third lock, viz, length between gates, 1,350 feet; width, 80 feet; and depth, 24.5 feet at extreme low water. The lock is to be connected with the same canal as the third lock.

During the fiscal year the widening of the present canal has been completed.

The amount expended on the general improvement for the fiscal year was $4,597.25. The total amount expended under the project of 1886, and its extensions and modifications to June 30, 1912, was $5,790,878.05, which amount includes $8,265.19 appropriated for settlement of claim, and the following amounts diverted as authorized by the river and harbor act of June 13, 1902: Applied to Sailors' Encampment, $20,000; for expenses of International Waterways Commission, $20,000 ($1,704.22 expended and $18,295.78 transferred); and for improvement of St. Clair Flats Canal, Mich., $86,491.28. The total amount expended for general improvement, including $2,625,692 expended on past finished projects, is $8,416,570.05. This amount includes $10,000 diverted from Great Lakes harbors appropriation of 1864.

The project of 1886 and its extensions and modifications, for general improvement, is practically completed, giving a canal 1⅗ miles long with width of 108 to 500 feet and depth of 24.6 feet in the upper portion, a movable dam, and a lock 100 feet wide and 800 feet long, with least depth of 17.7 feet below extreme low water surface 94.5 feet canal datum. The draft is restricted by the breast wall at the foot of the lock and the water level below the locks varies about 1 foot during the year.

In 1887 the freight passing the river was 5,494,649 short tons, valued at $79,031,757. In 1911 this traffic had grown to 53,477,216 short tons, valued at $595,019,844. The principal items of commerce are iron ore, coal, grain, and general merchandise. Average freight charges per ton mile have been reduced about 70 per cent since 1887. Details regarding the commerce of the canal are given in the report on operating and care of St. Marys Falls Canal, Mich.

The work of constructing the new lock and canal under the 1907 project has been in progress during the year. The excavation of the lock pit and the construction of sluice gates for controlling works in the new headrace for power plant were completed. Work on the west portion of canal and the new headrace was continued. Contracts have been let and some work done on other items of the project as follows: Excavating material and building revetment walls for second section of canal, between the railroad bridge and the lock, construction of the lock masonry, excavating the east approach and building the approach piers, building the lock gates, and furnishing steel, cement, timber, electric cables, etc., for the several portions of the work, the items being given in detail in the appended report of the district officer. The amount expended on new lock and canal project for the fiscal year was $598,842.28, and the total amount expended to June 30, 1912, was $1,328,441.56. Of the total estimated cost of the new lock and canal $4,225,000 has been appropriated and the balance, $1,975,000, authorized to be expended under continuing contract but not yet appropriated.

The amount estimated for profitable expenditure in the fiscal year ending June 30, 1914, will be applied to the construction of the third lock and canal in accordance with the project of 1907.

Canal widening, etc.

July 1, 1911, balance unexpended	$5, 849. 39
June 30, 1912, amount expended during fiscal year, for works of improvement	4, 597. 25
July 1, 1912, balance unexpended	1, 252. 14

New (third) lock and canal.

July 1, 1911, balance unexpended	$1, 995, 400. 72
June 30, 1912, amount expended during fiscal year, for works of improvement	[1]598, 842. 28
July 1, 1912, balance unexpended	1, 396, 558. 44
July 1, 1912, outstanding liabilities	134, 115. 00
July 1, 1912, balance available	1, 262, 443. 44
Amount appropriated by sundry civil act approved Aug. 24, 1912	1, 500, 000. 00
Amount available for fiscal year ending June 30, 1913	2, 762, 443. 44
July 1, 1912, amount covered by uncompleted contracts	2, 402, 613. 00
Amount of continuing contract authorization, act of Mar. 2, 1907	5, 000, 000. 00
Amount appropriated under such authorization	3, 025, 000. 00
Amount yet to be appropriated	1, 975, 000. 00
Amount (estimated) required to be appropriated for completion of existing project	[2]1, 975, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2]1, 475, 000. 00

New (fourth) lock.

Amount appropriated by river and harbor act approved July 25, 1912	$300, 000. 00
Amount available for fiscal year ending June 30, 1913	300, 000. 00
Amount (estimated) required to be appropriated for completion of existing project	[2]2, 975, 000. 00

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[1] Includes $58.05 paid by Treasury Department.

[2] Exclusive of amount available for fiscal year 1913.

Consolidated.

July 1, 1912, balance unexpended	$2,001,250.11
June 30, 1912, amount expended during fiscal year, for works of improvement	603,439.53
July 1, 1912, balance unexpended	1,397,810.58
July 1, 1912, outstanding liabilities	134,115.00
July 1, 1912, balance available	1,263,695.58
Amount appropriated by sundry civil act approved Aug. 24, 1912	1,500,000.00
Amount appropriated by river and harbor act approved July 25, 1912	300,000.00
Amount available for fiscal year ending June 30, 1913	3,063,695.58
July 1, 1912, amount covered by uncompleted contracts	2,402,613.00
Amount of continuing contract authorization, act of Mar. 2, 1907	5,000,000.00
Amount appropriated under such authorization	3,025,000.00
Amount yet to be appropriated	1,975,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 4,950,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 1,475,000.00

MENOMINEE HARBOR AND RIVER, MICH. AND WIS.

Prior to improvement by the Government, all commerce was transacted over bridge piers extending into Green Bay. Menominee is about 48 miles northeasterly from the city of Green Bay, and about 24 miles westerly from Sturgeon Bay Canal.

The harbor and river, which originally constituted two works, were consolidated by the act of June 13, 1902. The original depth of channel was about 5 feet, and no harbor existed at this place.

(*a*) *Harbor.*—The original project, adopted in 1871, provided for two parallel piers, 400 feet apart, extending to the 16-foot contour in Green Bay, and for a channel 15 feet deep between them, modified as follows: 1874, extending piers to 17-foot contour; 1890, increasing depth to 17 feet, 1899, increasing depth to 20 feet. Amount expended on original and modified projects, $234,344.77.

(*b*) *River.*—Original navigable depth, 5 feet. The original project, adopted in 1890, provided for a channel 200 feet wide and 17 feet deep, modified as follows: 1892, width at upper end reduced to 100 feet; 1896, formation of a turning basin 250 feet wide, 600 feet long, 17 feet deep at upper end of channel, and extending channel 425 feet for a width of 75 feet. Amount expended on original and modified projects, $114,414.15.

(*c*) *Harbor and river.*—The existing project, adopted by act of Congress approved June 13, 1902, provides for increasing the depth to 20 feet, at an estimated cost of $60,000. Under a provision of the act of March 3, 1905, the existing project was modified by omitting therefrom the improvement of all that portion of the Menominee River above and to the westward of Ogden Street Bridge.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $67,242.19, of which amount $28,990.50 was applied to maintenance. Of this amount $3,514.17 was derived from miscellaneous sources.

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[1] Exclusive of amount available for fiscal year 1913.

The existing project, as modified, was completed in 1903. Since then the expenditures have been for maintenance. The maximum draft that could be carried June 30, 1912, over the shoalest part of the locality under improvement was about 18½ feet. The mean annual variation of level of water surface is about 1 foot. The Menominee River is navigable for a distance of about 2 miles from its mouth.

Commercial statistics for 1911.—Menominee, Mich., and Marinette, Wis.: Total number of vessels, 1,069; shipments and receipts, 305,503 short tons; approximate valuation, $5,253,940.

It is believed that the project has a material effect in controlling freight rates on bulk commodities, such as coal, grain, and lumber, both locally and for transshipment.

It is proposed to expend the amount recommended for expenditure in fiscal year ending June 30, 1914, in repairs of piers and dredging for restoration of channel.

Amount that can be profitably expende din fiscal year ending June 30, 1914, for maintenance of improvement	$24,000

HARBOR AT ASHLAND, WIS.

Ashland Harbor is located at the head of Chequamegon Bay, on the south shore of Lake Superior, at a distance of 95 miles by water from Duluth. The bay is about 5 by 12 miles in size, the greater portion having ample depth for navigation, but a considerable distance along the harbor front was shallow and required dredging. This harbor was originally subject to more or less disturbance from waves generated within the bay by storms.

The original project, approved December 7, 1888, and modified February 9, 1889, was for the construction of a pile, slab, and rock breakwater 8,000 feet long, and for dredging a channel in front of the wharves of the city.

The existing project with modifications is for constructing a pile, slab, and rock breakwater 8,000 feet long; for building a second breakwater 4,700 feet in length as a shore spur, located 2,600 feet east of the present breakwater and parallel thereto; and for dredging a channel in front of the wharves of the city.

The total amount expended on this project and its modifications up to the close of the fiscal year ending June 30, 1912, not including outstanding liabilities, is $521,352.07, of which amount $294,357.76 has been applied to the maintenance of the improvement.

Under this project and its modifications there have been constructed 7,454 feet of breakwater on the original line and 842 feet on the line fixed by the act of June 6, 1900.

Of the 7,454 feet on the original line 91 feet is detached and uncompleted work near shore and 7,363 feet is completed breakwater in one piece.

This breakwater, as originally built of piles, slabs, and rock ballast, was a frail structure and required large expenditures for maintenance.

The work of revetting this structure with sandstone riprap so as to form a permanent rubble mound breakwater, with the old structure for a hearting, was begun May, 1903, and was completed for the entire length of 7,363 feet on October 20, 1909.

The dredged channel is in front of the westerly portion of the city. The easterly front has a natural depth of 18 to 20 feet at low water and is sufficient for the present needs of commerce.

The breakwater gives a protected area of about 1,600 acres and affords safe anchorage and dockage for a distance of 3 miles along the city front.

The proportion of the approved project accomplished up to June 30, 1912, is as follows:

Breakwaters: 93 per cent completed of the original project of 8,000 feet; 73 per cent of the 8,000 feet and the shore extension to same; 55 per cent if we take into account the 8,000 feet with its shore extension and also the detached breakwater half a mile to the east.

Percentage of channels completed is indefinite.

The commerce of this port carried by vessels consists principally of iron ore and lumber exported, and coal, mineral oil, and general merchandise imported. (With the commerce of Ashland are included the towns of Washburn and Bayfield, unless otherwise stated.)

The commerce has increased during the 24 years the harbor has been under improvement by the United States from 892 arrivals and clearances, with cargo tonnage of 1,400,000 short tons in 1887, to 1,758 arrivals and clearances, with cargo tonnage of 3,621,279 short tons, valued at $13,240,067, in 1911. The total commerce from 1887 to 1911, inclusive, is estimated at 88,318,877 short tons, valued at $579,437,930, exclusive of logs towed in rafts.

The total expenditures by the Government for this harbor to date are about one-eleventh of 1 per cent of the value of the vessel freight received and shipped during the period covered by these expenditures.

The annual expense of Government improvements at this harbor, consisting of maintenance, interest, and depreciation, is approximately $24,941, and amounts to $0.007 per ton of the vessel freight for 1911, to one-sixth of 1 per cent of the value of this freight, and to less than one-half of 1 per cent of the saving in the cost of transportation on the same freight by water as compared with rail rates.

Effect of project on freight rates: The estimated saving in cost of transportation by water over that by rail is $1.92 per ton, which is $6,327,938 for the business of this port in 1911.

The proposed extension of the breakwater for a distance of 637 feet is described, with estimate of cost, in the Annual Report of the Chief of Engineers for 1910, page 745, fourth paragraph. Present funds, appropriated 1911, will build the sandstone core to the rubble mound of this extension and the concrete superstructure to the pierhead.

The amount recommended for expenditure in fiscal year ending June 30, 1914, will be applied to continuing the work of refilling with granite rubble portions of the breakwater revetted with sandstone under the earlier contracts (1903 and later), where settlement and wear of the sandstone has occurred. The improvement is for channel extension, etc., and the work proposed is for the purpose of making the improvement available.

Amount (estimated) required to be appropriated for completion of existing project	$258,500
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	40,000

GREEN BAY HARBOR, WIS.

This work consists of two improved channels—first, from the mouth of Fox River northerly to the 21-foot contour in Green Bay, a distance of about 4 miles; second, Fox River below Depere to the southerly limits of the city of Green Bay, a distance of about 4 miles. The intervening pool in Fox River, connecting these channels, has a natural depth of from 25 to 40 feet and requires no improvement. The outer channel was originally circuitous and narrow, with an available depth of 11 feet. The original navigable depth of the inner channel was also 11 feet. The city of Green Bay is located at the head of Green Bay and is about 48 miles southwesterly from Menominee, Mich.

The original project for outer channel, adopted in 1866, provided for dredging a channel 200 feet wide, 13 feet deep, and 8,800 feet long, and for revetting about 650 feet of same at Grassy Island, modified as follows: 1872, straightening channel and increasing depth to 14 feet; 1874, depth 15 feet, length 11,600 feet; 1892, depth 17 feet, length 16,500 feet; 1897, increasing width at entrance to 500 feet. The original project for inner channel, adopted in 1892, provided for dredging a channel 150 feet wide and 13 feet deep, modified as follows: 1896, increasing depth to 17 feet. The total amount expended on original and modified projects is $405,945.18.

The existing project, adopted by act approved June 13, 1902, provides for increasing the depth of the outer channel to 20 feet, at an estimated cost of $105,600. It also provides for maintenance of existing works. There has been no modification of the existing project since its adoption.

The expenditures during the fiscal year have been for dredging for restoration of outer channel, for taking soundings, and for general supervision.

The amount expended on the work existing project up to the close of the fiscal year ending June 30. 1912, was $163,358.22, of which amount $61,018.50 was applied to maintenance.

The approved project was completed in 1903. Since then all expenditures have been for maintenance. The maximum draft that could be carried June 30, 1912, was about 18½ feet in the outer channel and 15 feet in the inner channel. The mean annual variation in level of water surface is about 1 foot. Connecting with the upper end of the inner channel at Depere, Wis., Fox River is navigable by canals and slack-water navigation to Portage, Wis., a distance of 156 miles.

Commercial statistics for 1911.—Total number of vessels, 518; shipments and receipts, 751,326 short tons; approximate valuation, $7,669,500.

The commerce of Green Bay is large and of a general character.

It is believed that the project has a material effect in controlling freight rates on bulk commodities such as coal, grain, and lumber, both locally and for transshipment.

It is proposed to expend the amount recommended for expenditure in fiscal year ending June 30, 1914, for dredging for maintenance of the outer and inner channels.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$14,000

KENOSHA HARBOR, WIS.

The original depth of water at the mouth of Pike Creek varied from nothing to 4 feet, and no harbor existed at this place.

The original project, adopted in 1852, provided for a channel 13 feet deep between parallel piers 150 feet apart, modified as follows: 1866, provided for a navigable channel 16 feet deep; 1889, provided for extending north pier 300 feet and south pier 600 feet and for channel 16 feet deep; 1890, provided for dredging in "The Basin"; 1899, provided for extending the south pier, increasing the width between piers to 250 feet by rebuilding the north pier, building 600 feet to breakwater, and increasing the depth in channel and basin to 21 feet and 20 feet, respectively; 1902, provided for extending the breakwater 100 feet shoreward. The original project as modified was completed in 1900, with the exception of 100 feet extension to breakwater. The total amount expended thereon, including maintenance up to the time of adoption of present project, is $475,815.37.

The existing project, adopted by Congress March 2, 1907, provides for maintenance of 21-foot entrance channel, 20-foot basin, and existing works, and for an extension of 200 feet to the landward end of the breakwater. Estimated cost, $22,000.

There has been no modification of the existing project since its adoption.

The total amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, is $57,314.47. Of this amount $26,891.44 was for maintenance. Of this amount $4.30 was derived from miscellaneous sources.

The existing project was completed in 1909.

The maximum draft that could be carried June 30, 1912, was about 16 feet. The usual mean annual variation of level of water surface is about 1 foot. Connecting with the western terminus of the Government improvement, Pike Creek is navigable for a distance of about 2,500 feet.

Commercial statistics for 1911.—Total number of vessels, 510; shipments and receipts, 80,731 short tons; approximate valuation, $4,985,330.

The commerce is not large in volume and is chiefly of a local character.

It is believed that the project has a considerable effect in controlling freight rates, not only on coal for local consumption brought in by way of the harbor, but also by affording Kenosha the rail rates accorded places at which water competition exists.

It is proposed to apply the amount recommended for expenditure in fiscal year ending June 30, 1914, in repairs of piers and breakwater and in dredging for maintenance of channel. The work proposed is necessary for maintenance of the harbor.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$24,000

KEWAUNEE HARBOR, WIS.

The original entrance to the Kewaunee River was not more than 20 feet wide, with a depth of about 3 feet at its shoalest point, and was obstructed by submerged bowlders. Originally there was no harbor at this place, and all commerce was transacted over bridge piers. Kewaunee is about 29 miles north of Manitowoc and about 26 miles south of Sturgeon Bay Canal.

The original project adopted in 1881 provided for an artificial entrance channel 15 feet deep, located about 2,000 feet south of the river mouth, protected by two parallel piers 200 feet apart, and extending from the shore to the 19-foot contour in Lake Michigan. The amount expended on this project to June 30, 1912, was $212,997.62, of which amount $62,997.63 was for maintenance. Of this amount $592.30 was derived from miscellaneous sources.

The existing project, adopted by the river and harbor act of June 25, 1910, provides for increasing the depth in entrance channel to 20 feet and for a turning basin of the same depth, to be formed by cutting away part of the point included between the old and present river channels, in accordance with the plan printed in House Document No. 324, Sixtieth Congress, first session, at an estimated cost of $53,690, subject to the following conditions:

First. The city of Kewaunee to donate or cause to be donated to the United States all land that must be acquired for the formation of the turning basin.

Second. The city of Kewaunee to hold the United States free from liability for all damages that may be claimed by riparian owners as a result of the dredging herein proposed.

Third. The city of Kewaunee to give satisfactory assurance that it will cause to be constructed, as soon as dredging has progressed sufficiently, a suitable revetment across the point between the old and present river channels.

The river and harbor act of July 25, 1912, authorized that condition No. 3 be waived in accordance with the report of the Board of Engineers for Rivers and Harbors, dated February 26, 1912, and printed in House Rivers and Harbors Committee Document No. 7, Sixty-second Congress, second session. There has been no other modification of this project since its adoption.

The expenditures during the fiscal year, made under the original project, have been for dredging, for restoration of channel under the original project, for repairs of piers, repairs and purchase of plant, and for general supervision.

The original project was completed in 1898 at a cost of about $150,000. Since then all expenditures have been for maintenance.

As the city of Kewaunee has failed to comply with any of the conditions precedent, no work has been done under the present project.

The maximum draft that could be carried June 30, 1912, was about 15 feet. The mean annual variation in level of water surface is about 1 foot. Connecting with the westerly end of the improved channel Kewaunee River has a navigable depth of 4 feet for a distance of about 6½ miles, but there is no regular commerce on the river.

Commercial statistics for 1911.—Total number of vessels, 367; shipments and receipts, 143,584 short tons; approximate valuation, $8,139,550.

The project has a material effect in controlling freight rates, as the car-ferry steamers form a lake-and-rail route between eastern and western points. It is impracticable to estimate the amount of reduction in rates thereby effected.

It is proposed to expend the amount recommended for expenditure in fiscal year ending June 30, 1914, in dredging for maintenance of 15-foot channel and in repairs of piers.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$6,000

PORT WASHINGTON HARBOR, WIS.

The natural channel at the mouth of the Sauk River was narrow, and at the shoalest point had a depth of 1 foot, and no harbor existed at this place. All commerce was transacted over bridge piers. Port Washington is about 25 miles north of Milwaukee and about 27 miles south of Sheboygan, Wis.

The original project, adopted in 1869, provided for a channel 14 feet deep between parallel piers 200 feet apart and the excavation and revetment of the west basin, modified as follows: 1870, width between piers reduced to 150 feet; 1876, provided for north basin, depth of channel and basins to be 13 feet. The original project as modified was completed in 1895, at a cost of $188,563.33. Since then all expenditures have been for maintenance. The total amount expended up to the date of adoption of the present project is $203,686.79.

The existing project, adopted by act of June 25, 1910, provides for increasing the depth in channel and basins to 18 feet below datum, in accordance with plan printed in House Document No. 306, Sixty-second Congress, second session, at an estimated cost of $30,000; estimated cost of dredging for maintenance, $2,500 annually. There has been no modification of the existing project since its adoption.

The expenditures during the fiscal year have been for dredging for maintenance of channel, for minor repairs to piers, repairs and purchase of plant, and for general supervision.

The amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, was $31,713.21, of which $9,266.91 was applied to maintenance.

The existing project has been completed and the full project depth obtained throughout the harbor. The maximum draft that could be carried June 30, 1912, was about 16½ feet. The usual mean annual variation of levels of water surface is about 1 foot.

Commercial statistics for 1911.—Total number of vessels, 163; shipments and receipts, 10,362 short tons; approximate valuation, $248,700.

The commerce benefited is small in volume and of a local character. It is believed that the project has a considerable effect in controlling freight rates, not only in coal for local consumption brought in by way of the harbor, but also in affording Port Washington the rail rates accorded places where water competition exists.

It is proposed to expend the amount recommended for expenditure in fiscal year ending June 30, 1914, in dredging for maintenance of channel and minor repairs to piers.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$4,500

HARBOR AT PORT WING, WIS.

Situated on the south shore of Lake Superior, 34 miles east of Duluth. The harbor consists of the improved mouth of Flag River, having an entrance channel 200 feet wide between the Government piers and a turning slip just within the entrance. The river proper has been improved at private expense.

Before improvement the depth at entrance was small and variable. It was 2 or 3 feet at times, and at other times the entrance was closed entirely.

Previous to Government operations the harbor had been improved by private parties to some extent. The entrance had been jettied, but imperfectly and with only partial success, and dredging was necessary every spring for removing a sand bar. Within the harbor much dredging had been done to accommodate the lumber business.

The existing project with modifications is for the construction of two parallel piers of piling, filled in with slabs and topped with large rock. These piers were to be located 200 feet apart and to be 800 feet and 825 feet long, respectively. A channel 150 feet wide and 15 feet deep was to be dredged between the piers and for 500 feet along the slough. Estimated cost $56,539.

The amount expended on this work to the close of the fiscal year ending June 30, 1912, exclusive of outstanding liabilities, was $56,776.24, of which $13,219.79 was for maintenance.

No work was done during the year. There was much less than the usual amount of shoaling, and the project depth of 15 feet remained throughout the greater portion of the Government channel.

The following results have been accomplished: The two entrance piers built, with lengths of 800 and 601 feet, respectively; 45 feet of pile revetment at the inner end of the east pier; dredging which gave an entrance channel 15 feet deep at low water, 100 feet wide, and extending from deep water in the lake through to a distance of 200 feet inside of the inner end of the east pier; a portion of the turning slip, extending 175 feet to the east, past the inner end of the east pier, with a width of 150 feet and a depth of 15 feet; a pile revetment 100 feet long at the inner end of the west pier; and maintenance of improvement by dredging of shoals and repairs to the piers.

A maximum draft of 15 feet can be carried June 30, 1912, at mean low water over the shoalest portion under improvement. The usual variation of water level extends from mean low water (low-water datum) to 1 foot above datum. This reference plane is a mean low stage of the lake, and is referred to bench marks.

Private dredging extended a navigable channel to a distance of about 2,500 feet southerly from the entrance, and this improvement marked the limit of navigation on Flag River. This stretch of river has been redredged from time to time by private enterprise, and the lower portion has an available depth of probably 14 feet for a short distance from the entrance, while the upper portion is now badly shoaled.

There remains to complete the approved project, dredging to increase the width of the entrance channel to 150 feet, the extension of the turning slip to a total distance of 500 feet from the east pier, and width of 150 feet, and the construction of 155 linear feet of pile revetment along the turning slip.

The proportion of the approved project accomplished up to June 30, 1912, is 80 per cent.

The vessel freight of this harbor was 64 arrivals and departures, with 31,127 short tons, valued at $305,000, in 1901, and 98 arrivals and departures, with 12,419 short tons, valued at $313,504, in 1911.

The freight tonnage in 1911 was 51 per cent less than that for the previous year.

The total freight of this port for the nine years, 1903 to 1911, inclusive, since the date of commencement of Government improvements, was 366,607 tons of 2,000 pounds.

The total expenditures by the Government for this harbor to date are only 1¼ per cent of the value of the vessel freight received and shipped during the period covered by these expenditures.

The annual expense of Government improvements at this harbor, consisting of maintenance, interest, and depreciation, is approximately $3,935. This amounts to 32 cents per ton of the vessel freight for 1911 and to 1¼ per cent of the value of this freight.

Effect of project on freight rates: This harbor has only water transportation for the movement of its freight, and for this reason no comparison can be made with freight charges by railroad.

The construction of a harbor here has been an essential factor in the development of the commerce of Port Wing. There was no commerce to mention previous to these improvements. In 1907 it amounted to nearly a million dollars.

It is proposed to expend the sum required for expenditure in the year ending June 30, 1914, in the following manner:

For continuing improvement (dredging and revetments)	$5,000
For maintenance (repairs, removing shoals, etc.)	5,000
	10,000

The work proposed is for the purpose of making the improvement available.

Amount (estimated) required to be appropriated for completion of existing project	$7,237
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	10,000

SHEBOYGAN HARBOR, WIS.

The depth of water over the bar at the mouth of the Sheboygan River originally did not exceed 7 feet. Prior to the improvement of this harbor by the Government the town and county of Sheboygan built two parallel piers 1,000 feet long, 175 feet apart, extending into Lake Michigan at the mouth of the Sheboygan River, and dredged between them to a depth of 12 feet. Prior to these improvements practically all the commerce at Sheboygan was carried on over bridge piers. Sheboygan is about 24 miles south of Manitowoc and about 52 miles north of Milwaukee.

The original project, adopted in 1866, provided for extending the piers built by the city and county of Sheboygan to the 13-foot contour and dredging between them to a depth of 13 feet; modified as follows: 1873, for dredging to a depth of 17 feet; 1881, for extending piers to 21-foot contour and a depth of 19 feet at entrance, diminishing to 15 feet at shore line; 1894, for increasing width between piers and for a channel 19 feet deep; 1899, for a breakwater 700 feet long; 1902, for extending both piers and increasing depth of channel to 21 feet. The original project as modified was completed in 1904 with the exception of 100 feet of breakwater. The total amount expended thereon, including maintenance, up to the time of adoption of present project is $575,099.44.

The existing project, adopted by Congress March 2, 1907, provides for maintenance of 21-foot channel and works incident thereto, for extension of north breakwater, for a south breakwater, and for subsequent necessary extensions to each breakwater in general accordance with type plan as set forth in report submitted in House Document No. 62, Fifty-ninth Congress, first session. In annual report for 1911, it is recommended that the work in the immediate future be confined to extending the north breakwater shoreward and postponing the construction of a south breakwater until its necessity should be more fully demonstrated. The estimated cost of this partial improvement is $362,000. The river and harbor act of July 25, 1912, adopted this modification of the project and made an appropriation of $125,000 therefor.

The amount expended under the existing project up to the close of the fiscal year ending June 30, 1912, was $73,888.98, of which $44,998.67 was for maintenance; of this amount $255.29 was derived from miscellaneous sources.

It is estimated that not more than 5 per cent of the approved project had been completed up to June 30, 1912. No result in the way of increased depth or width has been obtained, but the extension to the breakwater has somewhat diminished the disturbances in the harbor during storms. The maximum draft that could be carried June 30, 1912, was about 19 feet. The usual mean annual variation of level of water surface is about 1 foot. Connecting with the westerly end of the Government improvement, Sheboygan River is navigable for a distance of 1⅓ miles.

Commercial statistics for 1911.—Total number of vessels, 598; shipments and receipts, 661,886 short tons; approximate valuation, $8,299,425.

The commerce of Sheboygan is quite large and of a general character. It is believed that the project has a material effect in controlling freight rates not only on coal and other bulk commodities, both local and for transshipment, but also in affording to Sheboygan the rail rates accorded places at which water competition exists.

It is proposed to expend the amount recommended for expenditure in fiscal year ending June 30, 1914, in completing the partial improvement recommended in annual report for 1911 and adopted by the act of 1912.

Amount (estimated) required to be appropriated for completion of existing partial project	$237,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	237,000

TWO RIVERS HARBOR, WIS.

The original depth of the entrance to Twin Rivers was from 3 to 4 feet, and no harbor existed at this place. Two Rivers is about 5½ miles northerly from Manitowoc and about 50 miles south of Sturgeon Bay Canal.

The original project, adopted March 3, 1871, provided for the formation of a channel of navigable width and 13 feet deep, connecting Twin Rivers with Lake Michigan by building parallel piers extending to the 19-foot contour and dredging between them, at an estimated cost of $265,588.80, modified in 1897 by terminating the piers at the 14-foot contour. The total amount expended on original and modified project was $247,613.35.

The existing project, adopted March 2, 1907, is a modification of plan "A," printed in House Document No. 730, Fifty-ninth Congress, first session, and provides for increasing the depth of channel to 16 feet and for the construction of a stilling basin on the north side of harbor. The sum of $90,000 was appropriated for the purpose. There has been no modification of the existing project since its adoption.

The expenditures during the fiscal year have been for dredging for maintenance of channel, for minor repairs to existing works, for repairs and purchase of plant, and for general supervision.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $89,945.68, of which $36,386.28 was applied to maintenance.

The existing project was completed in 1909. Since then all expenditures have been for maintenance. The maximum draft that could be carried June 30, 1912, was about 16 feet. The mean annual variation in level of water surface is about 1 foot. East and West Twin Rivers have a navigable depth of 7 feet for a distance of about 3 miles and 7 miles, respectively, from the harbor piers. There is no regular commerce on these rivers. For many years they have been used by rowboats and for floating saw logs.

Commercial statistics for 1911.—Total number of vessels, 31; receipts, 25,140 short tons; approximate valuation, $183,130.

The commerce of this harbor is small in volume and of a local character. It is believed that the project has a considerable effect in controlling freight rates not only on coal for local consumption brought in by way of the harbor, but also affording Two Rivers the rail rates accorded places at which water competition exists.

It is proposed to expend the amount recommended for expenditure in fiscal year ending June 30, 1914, in dredging for maintenance of channel and in repairs of piers.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$4,000

FOX RIVER, WIS.

The Fox and Wisconsin Rivers, separated at Portage, Wis., by a distance of only 2 miles, one flowing into Lake Michigan, the other into the Mississippi River, were the early means of communication between those waters. Through a board of public works the State began and carried on the improvement until 1853, when it was transferred to a private company. In 1872 the United States purchased from the Green Bay & Mississippi Canal Co. all of its property except the water powers, water-power lots, and personal property.

The Fox River rises in Columbia County, Wis., and flows in a generally northerly direction, emptying into the head of Green Bay. The total length of the river is 176 miles. The length of the particular section included in the project, being from Portage to Green Bay, is 163 miles, including a canal 2 miles in length from the Wisconsin River to the Fox River at Portage. The lower end of the section under improvement is 7 miles from the mouth of the river.

The Wolf River is a tributary of the Fox River and rises in the northerly part of Langlade County, Wis., and flows in a generally southerly direction about 220 miles, emptying into the Fox River about 12 miles above Oshkosh. The particular section of the river included in the project, being from Shawano to the mouth of the river, is about 126 miles in length.

The present project is that of a board of engineers, submitted September 17, 1884, and modified May 14, 1886. It provides for deepening and widening the channel of Fox River from Green Bay to Montello to 6 feet depth and from Montello to Portage to 4 feet depth, with a width of the river channel from Lake Winnebago to Montello of 100 feet, and for the renovation of 12 old locks, at an estimated cost of $602,000.

Appropriations aggregating $618,750 have been provided for this work, and a revision of the estimate indicates that $130,353.36 will be required to complete it.

The river and harbor act of June 25, 1910, appropriated $25,000 for continuing improvement from Depere up to Portage, and provided that $3,000, or so much thereof as may be necessary of said appropriation, shall be used in removing bars and snags and otherwise improving Wolf River.

The expenditures during the fiscal year have been for dredging above Princeton Lock, dredging and snagging on Wolf River, repairs and renovation of plant, and for general supervision.

The amount expended by the United States on the improvement of the Fox and Wisconsin Rivers from 1839 (date of first appropriation) to the close of the fiscal year ending June 30, 1912, including about $600,000 expended for flowage damages and $145,000 paid to the Green Bay & Mississippi Canal Co. for its property, was $3,865,217.65, of which amount $591,161.39 was expended solely upon the Wisconsin River. The improvement of the Wisconsin River was abandoned in 1887.

The works on Fox River now consist of 18 stone locks, 2 stone guard locks, and 8 composite locks, 13 canals, 16 permanent and 1 temporary dam, and various accessories, including lock houses, warehouses, a dry dock, levees, wasteweirs, culverts, retaining walls, etc. The harbors of Stockbridge, Calumet, Miller Bay, and Brothertown, Lake Winnebago, have been improved, and snags have been removed and bars dredged in Wolf River, making a 4-foot channel 100 feet wide to New London.

The project depth of 6 feet below mean low water has for the most part been obtained from Depere to Princeton Lock, but the revision of the estimate indicates that there is still a large amount of dredging to be done in the levels between Butte des Morts and Princeton Lock where now but 5-foot depths obtain. The dredging of the 6-foot channel between Princeton Lock and Montello is now in progress.

The maximum draft that could be carried June 30, 1912, at mean low water over the shoalest part of the improvement was 5 feet from Depere to Berlin Lock, 4 feet from there to milepost 70 (about 17 miles above Princeton Lock), and 3 feet from milepost 70 to Portage, the head of navigation on the Fox River.

Commercial statistics for 1911.—Total number of vessels engaged in commerce on the river, 43; shipments and receipts, 170,313 short tons; approximate valuation, $736,617.

It is proposed to apply the amount recommended for expenditure in fiscal year ending June 30, 1914, in dredging between Princeton and Montello Locks in furtherance of existing project, and for maintenance of improvement of Wolf River and of harbors on Lake Winnebago.

Amount (estimated) required to be appropriated for completion of existing project	$130, 353. 36
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	20, 000. 00

HARBOR AT DULUTH, MINN., AND SUPERIOR, WIS.

This harbor is situated at the extreme western end of Lake Superior, and forms a terminus of the Great Lakes waterway. The area of this harbor is 19 square miles, of which 11 square miles are available for wharves and slips and 8 square miles are outside harbor lines and available for channels and basins.

The act of June 3, 1896, unified these harbors under the above title and provided for continuous contracts for its improvement to the amount of $3,130,553.

The several modifications have a combined estimated cost of $3,090,500, and together with the first estimate of $3,130,553 make a total estimated cost of $6,221,053 for the present project and its modifications.

The existing project, with modifications, therefore provides for dredging channels to a navigable depth of 20 feet, for extensive turning and anchorage basins of a navigable depth of 20 feet at the junctions of two or more channels, for the enlargement by about 209 acres of the anchorage area of the Duluth Basin by dredging to a depth of 22 feet, low-water datum, for widening the Duluth Canal, for rebuilding its piers and finishing them off with concrete superstructures built of monolithic blocks, for excavation of the lake approach to the Duluth Entrance to 30 feet for a width of 300 feet, and the following work at the Superior Entry: (*a*) Building two concrete revetment piers, one on each side of the entrance, 500 feet apart and terminating near the lake shore of Wisconsin Point; (*b*) building two converging breakwaters from the shore out to the 30-foot depth, with an opening of 600 feet on line with the axis of the inner entrance, to be of rubble mound construction, terminating in a crib and concrete pier at outer end and a pile pier at inner end; (*c*) dredging between the breakwaters to form a channel 600 feet wide and 30 feet deep, and further dredging to form a stilling basin; (*d*) dredging channel between revetments to a depth of 24 feet; (*e*) protecting the shore line by riprap; and (*f*) widening the Superior front channel inside the harbor. Total estimated cost, $6,221,053.

The amount expended on the existing project to the close of the fiscal year ending June 30, 1912, exclusive of outstanding liabilities, was $5,321,558.02, of which about $606,030 was expended for maintenance.

The lake commerce of this port, Duluth-Superior, during the last season of navigation (1911) amounted to 30,672,846 short tons, valued at $236,056,373, and from the beginning of improvements by the Government in 1867 to 1911, inclusive, the vessel freight entering and departing has amounted to 365,865,859 short tons, valued at $3,885,394,224.

It is believed that the tonnage of Duluth-Superior Harbor is now exceeded by that of but one port in the United States—New York.

The vessel freight of Duluth-Superior Harbor for 1911 was 57 per cent of the amount which passed the Sault locks the same year.

For a comparison between the cost of improvements and the volume of commerce it may be stated that the total amount of money expended by the Government on the improvement of this harbor from the commencement of work in 1867 up to June 30, 1912, is $6,869,741.02. The vessel freight received and shipped at this port during the same period was 365,865,859 short tons, and its market value was $3,885,394,224. From this it appears that the cost of Government improvements has been about one-sixth of 1 per cent of the value of the freight transported.

The annual expense of Government operations at this harbor, consisting of maintenance, interest on the total cost of improvements to date, and depreciation, is approximately $326,360. This annual expense, when compared with the commerce of the harbor, amounts to about 1 cent for each ton of the vessel freight for the year 1911. Compared with the value of the commerce the annual expense amounts to about one-seventh of 1 per cent of the value of the vessel freight for the same year. For a further comparison it appears that the annual expense is only about one-half of 1 per cent of the saving in cost of transportation by water as compared with rail rates on the same freight for the year 1911.

Effect of project on freight rates: It may not be possible to give exact figures showing the effect of the improvements of this harbor on freight rates, but the following statements have a bearing on the question:

The average rate on freight passing through St. Marys Falls Canals in 1911 was 0.67 (two-thirds of 1 mill) cent per mile per ton, and the average haul was 826 miles, as shown by the official records. If the same freight had been carried by rail the rate would probably have been as much as 3 mills per ton-mile, making a difference of 2.33 mills per ton-mile.

Assuming this difference to apply to freight for Duluth-Superior Harbor, and that the average haul is 826 miles, the saving in cost of transportation by water would be $1.92 per ton, and for the 30,672,846 tons received and shipped at this harbor in 1911, the saving in cost amounts to about $58,891,864 for that one year.

The saving in cost of this large sum has, of course, been made possible by the Government improvements, not only at this harbor but at St. Marys River and at other points between here and the Lake Erie ports, and it is not known just how much of the above saving should be credited to the Duluth-Superior improvements. It is evident, however, that with any reasonable proportion of such saving in transportation accredited to the improvements at this harbor, which form an essential and necessary part of the whole waterway, the cost of such improvements must be only a small fraction of the saving in freight rates effected thereby.[1]

The foregoing saving to shippers is based upon a comparison of existing rates of transportation by water and rail. In addition to this it should be said that the rail rates are reduced or kept down by the competition of the waterway, and in that way a further saving in transportation is effected. The two modes of transportation having developed contemporaneously during the last half century, it would be hard to say what the railroad rates would be if the Great Lakes waterway with its Government improvements did not exist, but there is hardly room for doubt that they would be materially higher.

It is proposed to apply the amount required for expenditure in the fiscal year ending June 30, 1914, in completing the work covered by adopted projects, and for maintenance.

The above is in part for extension of benefits to navigation and in part to make the existing improvements available.

With regard to the maintenance of improvements in this harbor, it is believed that this could be advantageously provided for by an annual allotment.

With 49 miles of harbor frontage, 17 miles of 20-foot channels, and the handling of over 30,000,000 tons of freight in the past year, there is necessity for the closest inspection, by a special patrol provided with a tug, to prevent injurious deposits, encroachments of wharves and other private structures, the enforcement of rules regarding the rafting of logs, the anchorage of vessels, the opening of draws, and the care of United States property. These, with the discovery and removal of shoals, repairs to Government piers, the care of parks, and the collection of complete and reliable commercial statistics, which has already proven of great value, it is thought could best be cared for by congressional action authorizing allotments or appropriations to be made on estimates submitted.

Amount (estimated) required to be appropriated for completion of existing project	$589,999.20
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	375,280.00

WARROAD HARBOR AND WARROAD RIVER, MINN.

Before improvement there was a good natural harbor of moderate depth at the mouth of Warroad River. Between the harbor and the river there was a bar having a least depth of 3.5 feet at ordinary lake stage (7.2 feet on the gauge) and between the harbor and the lake a bar having a least depth of 5 feet at ordinary lake stage. The channel of the Warroad River from the harbor to the steamboat landing (about 1 mile) was deep, but tortuous.

The river and harbor act of 1899, as amended by the act approved June 6, 1900, appropriated $3,000, or so much thereof as might be necessary, for improving the mouth of Warroad River, Minn. Nothing was done under this appropriation beyond making an examination and survey.

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[1] A similar saving in freight rates applies to other harbors in the Duluth district which have railroad connections and where harbor improvements executed by the Government (or in part at private cost) have opened up these harbors to interlake navigation and commerce. The above-named amount of saving in cost of transportation, $1.92 per ton, will be considered as also applying approximately to the harbors of Agate Bay, Ashland, Ontonagon, Marquette, Marquette Bay, and the local harbors of the Keweenaw waterway, subject to more or less error according to different local conditions, such as the class of freight, its destination, number of competing railroads, facility of handling freight by boat and by rail, etc.

The present project was adopted in 1902, and provided for building a dredge and dredging in the harbor a channel sufficient for boats drawing 7 feet of water. The estimated cost was $45,000. This project was modified in 1905 so as to provide for a channel 100 feet wide and 7 feet deep from the inner end of the harbor channel to the boat landing at Warroad, with a turning basin for boats at the inner end, at an estimated cost of $35,000. The project was further modified by the river and harbor act of June 25, 1910, in accordance with plan printed in House Document No. 703, Sixty-first Congress, second session, which provided for enlarging the turning basin so as to be 900 feet by 500 feet, at an estimated cost of $5,700, with $2,000 annually for maintenance thereafter. The total estimate is therefore $85,700. The river and harbor act of July 25, 1912, again modified the project so as to provide for deepening the channel by securing and maintaining a depth of 8 feet, $13,200 being appropriated therefor.

No work was done during the year.

The total amount expended to June 30, 1912, was $98,281.54, of which $24,850.15 was for work of maintenance. The project is completed.

The maximum draft that could be carried on June 30, 1912, was 6½ feet, the water being 3 feet below mean summer level.

The head of navigation on Warroad River is at the steamboat landing about a mile above the mouth.

The bars in this harbor are formed by wave action, and constantly recur. Annual dredging is therefore necessary for maintenance. It is estimated that $2,000 should be expended each year in work of maintenance.

The difficulty had in using the channel during the past two years was due to unusually low water in the lake, which appears to have been caused by the operation of dams maintained by water-power companies and lumbermen at the outlet of the lake on the Canadian side and in its tributaries, and the matter has been brought to the attention of the State Department for consideration by the International Joint Commission having jurisdiction over boundary waters. Should Congress desire that the project depth be maintained at such unusually low stages of water, this result can probably be accomplished most promptly by additional dredging. This difficulty will be overcome by securing the increased project depth authorized by the act of 1912.

During the season of 1911 the commerce amounted to 2,400 short tons of miscellaneous freight, valued at $214,000. There were also about 4,000,000 feet b. m. of logs towed; weight, 18,000 short tons; value, $80,000. Boats using the harbor carried about 9,200 passengers. The value of the business done could not be obtained.

This improvement has no effect on railroad freight rates. There are no railroads in competition with steamers on the lake.

The examination ordered by the river and harbor act of March 3, 1909, is printed in House Document No. 703, Sixty-first Congress, second session.

The amount estimated for the fiscal year 1914 will be applied to maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$2,000

ZIPPEL BAY, LAKE OF THE WOODS, MINN.

Zippel Bay is situated on the southern shore of the Lake of the Woods, about 26 miles by water from Warroad Harbor on the west and about 10 miles from the mouth of Rainy River on the east.

Before improvement the natural harbor at the inner end of Zippel Bay was connected with the bay by a long, tortuous channel about 75 feet wide, varying in depth from 4 to 6 feet. This channel is now practically closed.

The river and harbor act of February 27, 1911, adopted a project for improvement which contemplates dredging a channel through the bar separating the harbor from the bay 200 feet wide and 10 feet deep at mean summer level of Lake of the Woods (7.2 feet on the Warroad gauge), and building a jetty 2,800 feet long for the protection of this channel, and also to serve as a breakwater for an outer anchorage area, the estimated cost being $27,781. See House Document No. 1276, Sixty-first Congress, third session.

This project has never been modified.

During the year the material for the breakwater was assembled and the greater portion of it placed. It is expected to complete the project next year, after which work of maintenance will be necessary, the estimated cost being $1,000 annually.

The amount expended to June 30, 1912, $17,567.08.

The maximum draft that can be carried June 30, 1912, is nothing, the stage being nearly 3 feet below the mean summer level of the lake, which is 7.2 on the Warroad gauge, and very little dredging has been done.

Zippel River flows into the bay and is navigable for boats of light draft for a distance of 5 miles above the mouth.

During the season of 1911 the commerce of Zippel Bay amounted to 420 tons of miscellaneous freight. There were also carried 3,650 passengers.

There is no railroad near Zippel, and the improvement, therefore, has no effect on freight rates.

The amount estimated for the fiscal year 1914 will be applied to maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$1,000

RED RIVER OF THE NORTH, MINN. AND N. DAK.

This river has its source at the confluence of the Bois de Sioux and Otter Tail Rivers at Breckenridge, Minn. From there it flows in a northerly direction into Canada. Its length from source to international boundary is about 400 miles. The actual head of navigation is Bellmont, N. Dak., about 180 miles from the international boundary. Above Bellmont navigation is obstructed by numerous low fixed bridges.

Under this project are included the improvement of the Red River of the North, Minn. and N. Dak., and of Red Lake River, Minn.

Before improvement the ruling depth at low water in the Red River of the North from the Canadian frontier to Grand Forks, a distance of 143.5 miles, was 2 feet, and from Grand Forks to Moorhead, 155 miles, 1.5 feet. From Moorhead to Breckenridge, 97 miles, navigation was possible only at the higher stages. The river was obstructed by snags, overhanging trees, etc.

Red Lake River from the head of Red Lake to Thief River Falls, a distance of 135 miles, had a low-water depth of at least 3 feet in most places, but was obstructed by a bar at the mouth of the lake and by bowlders between Thief River Falls and High Landing, a distance of 35 miles, so that the ruling depth was 1.5 feet.

The project for the Red River, adopted in 1878, provided for dredging and removal of obstructions from Breckenridge to the international boundary and the construction of a lock and dam to overcome the fall at Goose Rapids, the whole being with a view to obtain channels as follows:

Breckenridge to Moorhead, 97 miles, a channel capable of being navigated during high and medium stages of water.

Moorhead to Grand Forks, 155 miles, a channel 50 feet wide and 3 feet deep at low water.

Grand Forks to the northern boundary line, 143.5 miles, a channel 60 feet wide and 4 feet deep at low water.

The estimated cost was $364,598.17. This project was modified as follows: In 1883 the estimated cost was increased to $398,598.17. In 1887 the proposed lock and dam at Goose Rapids was dropped from the project and the estimate reduced to $252,598.37. In 1893 the estimate was increased to $310,320.

The improvement of Red Lake River was added to the project in 1896. It was proposed to provide a depth of 3 feet by dredging and removal of bowlders from Thief River Falls to the head of Red Lake.

The amount authorized by Congress to be spent on this work was $9,000. The total estimate for both rivers is therefore at present $319,320. This addition to the project is completed.

The project at present in force contemplates channels of the dimensions given above from Breckenridge to the Canadian frontier, at an estimated cost of $310,000. It has never been more than two-thirds completed.

During the year the channel in the vicinity of Grand Forks was dredged where necessary, nearly 60,000 cubic yards being removed. Owing to lack of funds work was suspended June 15, 1912.

The total amount expended to June 30, 1912, was $360,142.17, of which $57,888.07 was for maintenance.

As a result of these expenditures some improvement was made in the few years subsequent to 1878 in the upper section of the river. No work has been done in this section in recent years because there has been no navigation. In the middle section the project was completed, except for 13 miles, in 1894. Since that time the river above Bellmont, N. Dak., has been obstructed by unauthorized bridges which do not permit navigation. In the lower section the project was completed in 1902.

Since the shoals in this river constantly recur, annual work of maintenance is necessary. The funds supplied not having been sufficient to maintain depth contemplated by the project, the navigable depth of the middle section is now 2 feet and of the lower section 3.5 feet. Nothing beyond work of maintenance has been done in recent years; this has been confined to dredging the worst bars in the vicinity of Grand Forks, N. Dak. The expenditure of at least $7,500 annually is required to keep the navigated portions of the river in condition.

On Red Lake River work has been confined to the removal of snags, bowlders, and similar obstructions from the channel. No work has been done since 1900, and in 1905 the floating plant used for this work was sold by authority of the Secretary of War.

The maximum draft that could be carried on June 30, 1912, north of Bellmont was 2½ feet, the river being 1 foot below its mean low summer stage. The usual variation of water surface is 25 feet; the maximum variation, 49 feet.

Red Lake River is navigable from Thief River Falls to the head of Red Lake, a distance of 135 miles. The maximum draft that could be carried on June 30, 1912, was 3 feet. Below Thief River Falls the river is not navigable. The usual variation of level is about 3.5 feet; the maximum variation about 6 feet.

Red River is regularly used during the summer season by two steamboats and 11 barges. During the season of 1911 about 3,000 short tons of wheat, lumber, and other merchandise and about 1,550 passengers were carried.

About 31,000,000 feet b. m. of logs were floated down Red Lake River during the season of 1911, their weight being 140,000 short tons and their value $500,000.

Rates on the Red River steamers are from 70 to 50 per cent less than the railroad rates between common points, but the project has no apparent effect on railroad freight rates.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$7,500

INDIANA HARBOR, IND.

This harbor is 6.5 miles southeast of Calumet Harbor, Ill., and was built by private enterprise by constructing parallel piers 300 feet apart projecting into Lake Michigan and by dredging a channel 21 feet deep between them. The northerly pier extends into the lake in a northeasterly direction 550 feet from the shore line of 1901, thence at an angle of 22° 30′ eastward 610 feet, thence at a similar angle eastward 575 feet, where it ends in 20 feet depth of water. The southerly pier runs parallel with the other for a distance of 1,055 feet, where a pier arm extends 200 feet in a northerly direction, thereby contracting the harbor entrance to about 100 feet. Both piers extend landward from the shore line of 1901 about 500 feet, where the channel is contracted to 65 feet width, the clear width of span of five railroad bridges at that point. There is also an inner harbor 200 feet wide which extends from these railroad crossings 1½ miles in a southwesterly direction, thence 2 miles due south to a point on the Grand Calumet River. From the bend in this channel there is proposed a branch canal 1½ miles long to connect with Lake George. At a point about 1.1 miles from the lake is a turning basin about 400 feet square.

The project for this improvement was adopted by Congress in the river and harbor act of June 25, 1910, and provides for an outer harbor about 300 feet wide and 22 feet deep (Chicago City datum), and an inner harbor or canal designed ultimately to extend to the Calumet River on the south, with a branch canal to Lake George on the west. The cost of this work was originally estimated at $62,000, with $5,000 annually for maintenance for the first three years after completion. The United States has assumed the maintenance of the outer harbor and has done the necessary dredging to provide an adequate channel of approach to and between the piers. It is proposed to take over the inner channel or waterway and assume its maintenance as fast as private interests shall complete the channel way and equip it with suitable bridge draws. The full project is reported in House Document 1113, Sixtieth Congress, second session. A very full description of present conditions is to be found on pages 186 to 188, Bulletin No. 21 (1912), issued by United States Lake Survey Office.

Title to the right of way, including a turning basin, became vested in the United States October 28, 1910, and December 29, 1910, respectively.

For this work $62,000 was appropriated by the river and harbor act of June 25, 1910, and the general deficiency act approved March 4, 1911, contained a provision making available so much as may be necessary of the unexpended balance of the appropriations heretofore made for this harbor as in the discretion of the Secretary of War may be necessary for maintenance of the inner harbor, in accordance with the provisions of House Document No. 1113, Sixtieth Congress second session.

When the estimate and project for the improvement of this harbor were made, the lake survey office was engaged in making an extensive survey of the southern end of Lake Michigan, including this locality, the result of which disclosed good reasons for change in direction of the entrance channel and necessitated a channel of much greater length and width than had been anticipated. This survey further indicated a number of bars at the approach to the harbor. The lengthening and widening of the channel, together with cutting through the bars, will, it is estimated, increase the amount to be dredged by 139,600 cubic yards, which at 25 cents per cubic yard, the present contract price for dredging in the lake, equals $34,900, or, in round figures, $35,000. The estimate was increased and this amount included in report for 1911.

There has been expended on the present project to June 30, 1912, the sum of $60,667.41.

Operations were in progress during the year under a contract for dredging the channel in accordance with the approved project, under which a beginning was made last year, and resulted in the removal of 234,363 cubic yards of material. The Lighthouse Department placed the necessary aids to navigation marking the entrance channel.

The maximum draft that can be carried over the shoalest part of this locality is 22 feet.

As the area outside of the present harbor is not protected by a breakwater, the dredged channel is liable to shoal very materially.

The question of appointing a deputy surveyor of customs to gather commercial statistics is understood to have been under consideration, but such appointment has not yet been made and no data as to such statistics are available. Information from industries located on this waterway indicates that a large water tonnage will develop upon completion of the proposed improvement, which will probably decrease freight rates.

By the act approved February 27, 1911, Congress ordered a preliminary examination to be made at this harbor, with a view to the construction of a breakwater to protect the entrance of the harbor. This report is printed as House Document No. 690, Sixty-second Congress, second session, and summarized herein.

It is proposed to apply the available funds and those asked for to complete the improvement and for maintenance of this channel.

Amount (estimated) required to be appropriated for completion of existing project	$15,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	25,000

Indiana Harbor is an artificial channel, located partly in Lake Michigan and partly inland. The outer portion is being dredged by the United States to a depth of 20 feet. The inner harbor is a canal, dredged by private interests and designed ultimately to extend to Calumet River and Lake George.

The following report of the Board of Engineers on a recent survey, in which the Chief of Engineers concurs generally, is printed in House Document No. 690, Sixty-second Congress, second session:

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, February 27, 1912.

Respectfully returned to the Chief of Engineers, United States Army.

A survey of Indiana Harbor having been made by the district officer, he submits a plan for the construction of a timber-crib breakwater to protect the entrance, the proposed location of which is shown at a–b and c–d on the accompanying map. The estimated cost is as follows:

a–b, 2.000 linear feet	$248,530
c–d, 4,950 linear feet	682,160
	930,710

The district officer states that simultaneously with the construction of the breakwater the harbor entrance piers should be rebuilt on straight lines and that a public dock should be provided by the municipality of East Chicago at some point on the canal. The owner of the present north pier has offered to transfer the pier and a small piece of land at its shore terminus to the United States free of cost when an appropriation shall have been made for its reconstruction. The owner of the present south pier has agreed to rebuild it in prolongation of the line B–C out to a point where it will intersect the line E–F on accompanying map in case the United States will construct the breakwater, it being the desire of the owner to fill in out to line E–F. The board is of opinion that the piers should not be extended beyond the ends of the red lines by which they are indicated on the map, and that filling on the south side should be restricted to the area within a straight line drawn from the outer end of the proposed south pier to the point E on the map and thence along the approved harbor line. The limits of filling on the north side should be left for future decision by the department. From a letter from the mayor of East Chicago accompanying the within report it appears that negotiations have been completed for the acquirement by the city of East Chicago of two sites on the Indiana Harbor Canal at which it is proposed to construct docks for public use.

In view of the danger and liability of delay to present navigation by reason of the absence of a protecting breakwater and the large increase that may confidently be expected to occur in the near future in the present commerce of Indiana Harbor, the district officer expresses the opinion that this harbor is worthy of further improvement by the construction of a breakwater to protect the entrance of the harbor. The division engineer concurs with the district officer regarding the worthiness of the proposed improvement and the proposed location of the breakwater and piers. He differs, however, as to the length and type of breakwater proposed, believing that the two arms of the breakwater should be connected with the shore and that a rubble-mound breakwater or one with a concrete superstructure should be substituted for the timber-crib structure. He also believes that if permits are granted private corporations to occupy lands on both sides of the entrance to the inner harbor they should construct the piers, which would then become revetments to private property. In order to have all essential data before it, the board requested and obtained from the district officer estimates of cost covering the construction of a rubble-mound breakwater and a breakwater of timber cribs with concrete superstructure, amounting, respectively, to $1.033,200 and $1,147,800. Timber-structure shore connections are estimated at $108,900 for the eastern breakwater and $200,000 for the northern breakwater.

The general commercial situation at this harbor was discussed by the board in its indorsement of September 26, 1911, reviewing the report on preliminary examination, and in previous reports on this harbor. While the harbor is of comparatively recent origin, its commerce is already large, and indications point to rapid growth in the future. To adapt the inner entrance for the uses of commerce, the piers should be reconstructed on the lines proposed by the district officer and indicated on the map, but the board is of opinion that this work should properly be done at local expense, particularly in view of the fact. as pointed out by the division engineer. that under the plan of filling proposed by private parties. these piers will eventually become revetments to valuable private property. The board is of opinion that it is advisable for the United States to undertake the construction of a suitable breakwater to protect the entrance to the harbor. and it believes that the rubble-mound breakwater, estimated to cost $1,033,200. is preferable to the timber crib, and should be adopted with provision for one or both shore connections, in case experience indicates their advisability, the project being conditional on assurance being given, satisfactory to the Secretary of War. that the piers will be reconstructed at the expense of local interests and that a suitable public wharf or wharves will be built and maintained by the city. The initial appropriation should be $300,000. with authority for a continuing contract, and funds should thereafter be appropriated at the rate of $300,000 per annum.

In compliance with law, the board reports that there are no questions of water power involved at this locality, and. except as proposed above, there are no questions of terminal facilities or other related subjects which could be coordinated with the recommended improvement to lessen the cost thereof and compensate the General Government for expenditures made in the interests of commerce and navigation.

For the board:

Wm. T. Rossell,
Colonel, Corps of Engineers,
Senior Member of the Board.

The following is from the report of the district officer:

The present commerce of Indiana Harbor amounts to about 2,320,000 tons. Correspondence with owners of land and manufacturing establishments in the vicinity shows their intention to make use of water transportation as soon as an adequate channel and a safe harbor has been secured. In fact, some of the plants have been located at Indiana Harbor with the expectation of obtaining such transportation facilities. Not only will it be possible to make shipments from Indiana Harbor by large lake carriers to distant points, and that such future shipments will be made is evident from correspondence with owners and managers of manufacturing plants at Indiana Harbor. but the waterway after completion will also find a great usefulness in local deliveries to points in Chicago and its vicinity. The inclosed eight letters (not printed) show that at the present time deliveries of freight from Indiana Harbor to Chicago require from three to five days by rail. and that the railroad companies find it to be a physical impossibility to reduce this time. On the other hand, delivery can be made by boat in 24 hours. It appears, therefore, that with the completion of the inner and outer channels a very large traffic will be carried on at Indiana Harbor by the waterway.

CALUMET RIVER, ILL. AND IND.

This river forms the inner harbor of Calumet Harbor. About 7.83 miles from Lake Michigan is the "Junction" or head of Main Calumet River where it divides into the Little Calumet and Grand Calumet Rivers. The project depth of 21 feet extends up the main river to the "Forks" (entrance to Lake Calumet), a distance of 6.18 miles from its mouth. Grand Calumet River is a lagoon or bayou about 18 miles long and has no current except that caused by floods or variations in the water level of Lake Michigan and has an average depth of 5 feet to the entrance of Indiana Harbor Canal, distant about 5.17 miles from the "Junction." Little Calumet River is a very crooked stream about 60 miles long and has an average depth of about 8 feet to the site of an old stone dam at Blue Island, Ill., distant about 7.14 miles from the "Junction." All depths are referred to Chicago city datum. (See Chicago Harbor report.)

Before improvement of Calumet Harbor by the United States (1870) this river, while having a navigable channel of about 100 feet width and 13 feet depth for about 4 miles length, could not be reached from the lake by boats of over 4-foot draft, because of the bar across its mouth, and its commerce was then practically nothing. At the time of the improvement of the river itself (1884), the river had become navigable for 12-foot draft over widths of about 100 feet and a length of about 4 miles; and for boats of 5-foot draft over widths of about 50 feet and lengths from the river mouth of about 16 miles in the Grand Calumet and about 14 miles in the Little Calumet. The commerce at that time was, however, less than 500,000 tons.

The projects of 1884 to 1896, now ended, secured a permanent channel of 200 feet width and 20 feet draft from the mouth of the river about 2 miles upstream (including a small turning basin near the mouth of the river), thence 16 feet draft about 3 miles farther, except over short portions, where rock reduced the width to 85 feet and the depth to 14 feet; and, in addition a temporary channel of 10 feet depth and 60 feet width, in the next 6 miles, up to a point on the Grand Calumet one-half mile east of Hammond, Ind. (about 11 miles above the mouth).

There has been expended on previous projects $446,718.98, including $45,230.48 for maintenance.

The existing projects, adopted by act of March 3, 1905, provided for a channel 200 feet wide and 20 feet draft from the mouth of the river to One hundred and twenty-second Street, and of the same width and 16 feet draft from One hundred and twenty-second Street to the forks, with five turning basins, at a total estimated cost of $662,480.50 and $10,000 per annum for maintenance. (See p. 605, Annual Report of the Chief of Engineers for 1906.) The construction of the turning basins was made contingent upon the donation of the necessary land to the United States free of cost.

The river and harbor act of June 25, 1910, modified this project in accordance with report printed in House Document No. 172, Fifty-eighth Congress, second session, so as to permit the use of turning basins above No. 1 of such shape and dimensions as will enable a vessel 650 feet in length to turn with ease; and that it shall be further modified so as to provide a navigable depth of 20 feet from One hundred and twenty-second Street to the forks of the river, and a turning basin at the forks having a similar depth and a water surface diameter of 750 feet, in accordance with report printed in House Document No. 349, Sixtieth Congress, first session; and that the amounts heretofore appropriated shall be available for such modified project.

For estimates, see pages 2942–2949, Annual Report of the Chief of Engineers for 1904; for map, see page 1902 of the report for 1903; also for fuller details, see House Document No. 172, Fifty-eighth Congress, second session, and House Document No. 349, Sixtieth Congress, first session.

The total amount covered by these estimates, $820,500, has been appropriated and was believed to be sufficient for completing the entire project and allowing five years (1906–1910) of maintenance at $10,000 per year, one year (1911) of maintenance at $20,000, and one year (1912) at $10,000. An examination and survey made during the summer of 1911, however, indicated that the estimated cost of completing the project was too low, principally on account of the dimensions of turning basins Nos. 1 and 5 having been enlarged, and authority was obtained to increase the estimate by $95,000.

The act of June 13, 1902, authorized the Secretary of War to accept deeds, free of expense to the United States, for lands necessary to make a proper channel 200 feet wide from the forks up to a point one-half mile above Hammond, Ind. (a stretch of about 5.5 miles).

There has been expended on the present project (adopted in 1905) to June 30, 1912, $740,274.24, of which $21,639.62 was for maintenance.

The following work was accomplished during the year: Under continuing-contract authorization 232,878 cubic yards of material were dredged, of which 111,931 was maintenance. Surveys made last year were plotted and maps drawn.

The acts of June 13, 1903, and March 3, 1905, authorized the Secretary of War to accept deeds free of expense to the United States for the acquisition of lands for widening the river and for turning basins Nos. 1 and 5. The land for turning basins Nos. 1 and 5 has been acquired and the basins have been dredged.

Some deeds have been tendered for the lands necessary for widening the river between the "Forks" and the junction of the Little and Grand Calumet Rivers, a distance of about 1.65 miles. Although Congress has authorized the Secretary of War to accept such deeds for lands above the Forks, no appropriation has been made for doing the work.

The right of the Sanitary District of Chicago to reverse the flow of Calumet River is still pending in the United States circuit court at Chicago.

A permit for this work was given by the Secretary of War June 30, 1910, upon certain-named conditions, one of which being that the total flow of water through the Calumet and Chicago Rivers shall not exceed the present permitted flow through the Chicago River (250,000 cubic feet per minute); another that the above-mentioned suit shall in no wise be affected by the issuance of the permit.

Expenditures up to date have resulted in a channel 21 feet depth (Chicago datum), from the river mouth to the "Forks," including turning Basin No. 5, except at the sites of the Calumet Western and

Western Indiana Railroad bridges and that of the Torrence Avenue pontoon bridge; thence about 5 feet depth, with about 50 feet width (dredged prior to 1895 to 10 feet depth and to 60 feet width, but since partly filled up) to Hammond, Ind.

The maximum draft that can be carried at mean low water is as indicated above, and the river is farther navigable for 6-foot draft boats to Riverdale on the Little Calumet, 12 miles from the river mouth. It can also be used by light-draft launches, such as can pass under bridges, nearly to Gary on the Grand Calumet, about 20 miles from the river mouth, and to Blue Island on the Little Calumet, about 14 miles from the river mouth, being stopped at that point by rapids.

The water level has variations of about 6.5 feet from highest known to lowest known water, and an average of less than 1 foot per day. At dead low water the river is practically level from the lake up to the junction of the Grand and Little Calumet. The current is very slight except during freshet and lake seiches.

The annual commerce has reached about 7,000,000 short tons, the principal items being iron ore, grain, and coal. New manufacturing plants are steadily occupying the river banks as fast as the 20-foot depths are carried upstream.

The existence of this improved river is considered to be of great use in controlling freight rates and is claimed to save at least 50 cents per ton over Chicago River rates and more over the usual Calumet (South Chicago) railroad rates.

It is proposed to apply the funds now available and those asked for to completing the 1903 project, adopted by act of March 3, 1905, as modified by act of June 25, 1910, and to maintenance.

Under appropriation of August 18, 1894, for "above the forks," $1,908.45 is still available, but dredging has been discontinued because of constant refilling.

A statement of past examination and survey reports will be found on page 605, Annual Report, 1906, and reference to report on examination made in compliance with act of March 2, 1907, will be found on page 681, Annual Report, 1908.

Amount (estimated) required to be appropriated for completion of existing project	$95,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	20,000

The following letter of the Chief of Engineers, submitting report on a survey, printed in House Document No. 172, Fifty-eighth Congress, second session, is added as bearing on the provision in the bill abandoning as navigable water of the United States a certain portion of the old channel of the Calumet River in Chicago, rendered useless by a recent improvement in the nature of a cut-off.

A part of the old channel recommended to be so abandoned in this document was abandoned by act of April 24, 1904. (Laws Relating to the Improvement of Rivers and Harbors, 1790 to 1907, vol. 2, p. 1048.) The provision in the present bill relates to another portion of the old channel:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS.
Washington, December 11, 1903.

SIR: I have the honor to submit herewith reports, dated August 3 and September 16, 1903, with map, by Col. O. H. Ernst, Corps of Engineers, on examination of Calumet River, Illinois and Indiana, ordered by section 1 of the river and harbor act approved June 13, 1902.

Calumet River is now being improved by the General Government under a project to provide a channel 200 feet wide, 20 feet deep (excavating to a depth of 21 feet), to One hundred and twenty-second Street (about 4.2 miles from the mouth); 16 feet deep from One hundred and twenty-second Street to the forks (about 5.5 miles from the mouth); and 10 feet deep from the forks to a point one-half mile above Hammond (10.5 miles from the mouth). The improvement contemplated by the present examination involves the modification of the existing project so as—

1. To provide a navigable channel 22 feet deep from the mouth to One hundred and sixth Street.
2. To include in the improvement the old channel of the river between One hundred and thirteenth and One hundred and sixteenth Streets.

With reference to that part of the stream below the forks, Col. Ernst states that the proposed increase in depth between the mouth and One hundred and sixth Street is not required at this time, and that the old bed of the river between One hundred and thirteenth and One hundred and sixteenth Streets is of no value to the United States, except that a portion of it at one end might be utilized for a turning basin. In his opinion this section is worthy of improvement by the General Government to the extent proposed by the existing project.

As regards the portion above the forks he states for reasons given that the work is not worthy to be undertaken by the United States.

Col. Ernst estimates the cost of projected work at $662.480.50, which includes the excavation of five turning basins having a least diameter of 650 feet, four of them 21 feet deep, the other 16 feet deep. The sum of $10,000 will be required annually for maintenance.

This estimate does not provide for the cost of land required for the turning basins estimated to cost $161,342, which the local officer thinks should be given for the purpose free of charge, and he is of opinion that the adoption of this feature of the project should be conditional upon a free right of way.

These reports have been reviewed by the Board of Engineers for Rivers and Harbors under the provisions of section 3 of the said act of June 13, 1902, and attention is invited to its reports on the subject in letter of August 14 and indorsement of November 11, 1903, herewith.

I concur in the views and recommendations of the board as summarized in its report of November 11, 1903, viz:

"That so much of the site of the former channel between One hundred and thirteenth and One hundred and sixteenth Streets as is not needed by the United States for a turning basin be abandoned as navigable waters of the United States, and that the project for the improvement of the Calumet River be this:

"To provide a channel 200 feet wide and 20 feet deep from the mouth of the river to One hundred and twenty-second Street, and of the same width and 16 feet deep from One hundred and twenty-second Street to the forks, with five turning basins, at a total estimated cost of $662.480.50, and $10,000 per annum for maintenance; and to acquire, as prescribed in the act of June 13, 1902, the land required for a channel 200 feet in width from the forks to a point one-half mile above Hammond, Ind."

Very respectfully, your obedient servant,

G. L. Gillespie,
Brigidier General, Chief of Engineers, U. S. Army.

Hon. Elihu Root,
Secretary of War.

WAUKEGAN HARBOR, ILL.

Originally there was no navigable channel or natural harbor at this place. Waukegan is about 49 miles south of Milwaukee and about 36 miles north of Chicago.

An appropriation of $15,000 was made in 1852 "for the improvement of the harbor and breakwater at Waukegan, Ill." The plan adopted was the construction of a breakwater parallel to the shore in about 20 feet of water and opposite the heads of two bridge piers in the open lake, from which the commerce of the place was carried on. One crib was placed in position but was carried away by a storm, and the work was abandoned.

The original project was adopted in 1880 and provided for an artificial harbor of sufficient capacity for local trade by inclosing an area with pile piers, the entrance channel and inclosed area to be dredged to 13 feet. The amount expended on original project was $218,944.41.

The existing project, adopted by act of June 13, 1902, provides for extending both harbor piers, building a breakwater, and increasing depth of channel to 20 feet; estimated cost, $345,000. There has been no modification of the existing project since its adoption.

The total amount expended on the work of existing project up to the close of the fiscal year ending June 30, 1912, is $443,117.42. Of this sum $132,778.03 was for maintenance, of which amount $296.76 was derived from miscellaneous sources.

The approved project was completed in 1904. Since then all expenditures have been for maintenance.

The maximum draft which could be carried June 30, 1912, was about 19 feet. The usual mean annual variation of water level is about 1 foot.

Commercial statistics for 1911.—Total number of vessels, 1,142; shipments and receipts, 213,925 short tons; approximate valuation, $2,085,220.

The commerce affected by the project is mostly coal and salt for transshipment.

It is believed that the harbor is of great convenience to general commerce, being a terminus of the Elgin, Joliet & Eastern Railway, known as the Chicago Outer Belt Line. The harbor is in close connection with all the railways entering Chicago.

It is believed that the project has a considerable effect in controlling freight rates on coal and other bulk commodities.

It is proposed to apply the amount recommended for expenditure in fiscal year ending June 30, 1914, in repairs of piers and breakwater and dredging. The work proposed is necessary for maintenance of the harbor.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$18,500

CHICAGO HARBOR, ILL.

The inner basin of this harbor, covering an area of 270 acres, is formed by the easterly breakwater, 4,036 feet long, and the southerly breakwater, about 3,000 feet long. The entrance to this basin and to Chicago Harbor is protected by an exterior breakwater 5,413 feet long, located in Lake Michigan about three-fourths mile northeast from the entrance of Chicago Harbor. The harbor is distant 34½ miles in a southerly direction from Waukegan Harbor, Ill., and 12½ miles in a northerly direction from Calumet Harbor, Ill.

Before improvement by the United States the Chicago River made a sharp bend southward just before reaching Lake Michigan, and had its outlet fully half a mile from its present mouth, leaving between the river and the lake a long sand bar. The depth at the entrance was only about 3 to 4 feet.

There was expended on the work prior to operations under the existing project of 1870 and its modifications $446,005.

The present project, adopted in 1870, was modified in 1878, 1896, 1903, and 1905; that for present increased depth of dredging in outer harbor being given by report of July 16, 1897 (p. 2791, Annual Report of the Chief of Engineers for 1897), specifically adopted by act of March 3, 1899; and that for repair of north pier being given by report of July 14, 1903 (p. 1888, Annual Report of the Chief of Engineers for 1903), adopted by act of March 3, 1905; such projects including:

(*a*) Breakwaters to form an outer harbor, with dredging within the same for 20-foot draft (21-foot depth).

(*b*) Exterior breakwater, with a harbor of refuge behind the same.

(*c*) Dredging entrance to inner harbor or mouth of Chicago River to same depth as outer harbor.

(*d*) Maintenance.

There has been expended on the project of 1870, with its modifications, to June 30, 1912, the sum of $2,126,554.39, of which $140,638.35 has been for maintenance since 1903.

The work done during the year was the partial repair of piers and breakwaters where damaged by storms, and dredging at harbor entrance.

The project has been completed, except the dredging of the westerly portion of the outer harbor basin for 20-foot draft and necessary maintenance of the harbor works.

The work of improvement has resulted in the widening and deepening of the inner harbor (entrance to Chicago River) by erecting piers on either side of the river and dredging between them until it has now a width ranging from 470 feet at its lake end to about 200 feet at its river end, and a depth of 21 feet; the formation of an outer harbor basin south of the entrance to Chicago River by inclosing within breakwaters about 270 acres of the area of Lake Michigan, the basin having a depth of 21 feet over its easterly portion and 10 to 14 feet over its westerly portion; and the erection of an exterior breakwater about 1 mile north of the entrance to the river to shelter said entrance and the outer harbor from northerly storms and to form a harbor of refuge.

Chicago outer harbor, being mainly a protection to Chicago River entrance, has practically no commerce except that of the river, the outer basin being used mainly by yachts and other small craft. The lake commerce of Chicago, after having risen to more than 8,000,000 short tons in 1892, diminished to 4,025,000 short tons in 1908, and in 1911 was 4,025,576 short tons, and the harbor works, while formerly having added about 5,000,000 tons to the river commerce, are now needed mainly to prevent a further loss of the 4,000,000 tons remaining.

The existence of this improved harbor is considered to be of great use in controlling freight rates.

The rebuilding of the easterly and southerly breakwaters, in concrete, has been authorized, and funds provided, but the work has been postponed on account of contemplated improvements on the lake front by the city and park commissioners embodying a modification of the existing harbor lines.

It is proposed to apply the available funds, together with those asked for, to the maintenance of existing works, rebuilding in concrete the superstructure of the easterly and southerly breakwaters and the south harbor pier, which is in a very dilapidated condition and requires rebuilding, and in the extension and construction of breakwaters to form an outer harbor behind the existing exterior breakwater.

The examination and survey of harbors and rivers in the Chicago district for the purpose of reporting a plan for a complete, systematic, and broad improvement of harbor facilities for Chicago and adjacent territory was made and report thereon submitted and published as House Document No. 710. Sixty-second Congress, second session.

This document presents a project for the extension and construction of breakwaters to secure an outer harbor behind the existing exterior breakwater, at an estimated cost of $1,211,195, which was specifically adopted by Congress in the river and harbor act approved July 25, 1912. This act carries an appropriation of $350,000, with the proviso that the work shall not be commenced until assurances satisfactory to the Secretary of War shall have been received that the work contemplated by the city of Chicago as a part of said improvement will be actually undertaken by the city.

Amount of continuing contract authorization, act of Feb. 27, 1911	$240,000
Amount appropriated under such authorization	240,000
Amount (estimated) required to be appropriated for completion of existing project	861,195
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	250,000

Following is the letter of the Chief of Engineers submitting report on a recent survey, printed in House Document 710, Sixty-second Congress, second session:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, April 20, 1912.

SIR: I have the honor to sumbit herewith, for transmission to Congress, reports dated August 28, 1909, by Maj. (now Lieut. Col.) Thomas H. Rees, Corps of Engineers, and October 7, 1911, with map, by Lieut. Col. George A. Zinn, Corps of Engineers, on preliminary examination and survey, authorized by the following item of the river and harbor act approved March 3, 1909:

"Harbors and rivers at or near Chicago, Illinois, including Chicago Harbor, Chicago River, Calumet Harbor, Grand Calumet and Little Calumet Rivers, Illinois and Indiana, Lake Calumet, and necessary connection with Calumet River, and the lake shore from the mouth of Chicago River to the city of Gary, Indiana, for the purpose of reporting a plan for a complete, systematic, and broad improvement of harbor facilities for Chicago and adjacent territory."

Also a supplemental report dated November 28, 1911, by Col. Zinn, containing an estimate of the cost of the work to be done by the United States in connection with the proposed harbor at the entrance to Chicago River.

The report in this case, by the district officer, is complete and comprehensive and includes consideration of the question of establishing a general commercial harbor at some suitable point on the lake front and also the improvement of the localities specified in the act. The plan proposed by the district officer contemplates the construction of a general commercial harbor or joint terminal at some point on the lake front for handling through bulk freight, and a terminal on the Sanitary Canal near Argo for handling through canal and lake and local canal freight, and the improvement of certain local interior waterways. The subject in its entirety is complex and demands further careful study before final report. Recent developments, however, indicate the desirability of early action in regard to the proposed harbor development at the mouth of the Chicago River, and the Board of Engineers for Rivers and Harbors, to whom these reports were referred, as required by law, therefore submits a report thereon, dated April 15, 1912, as a partial report under the act, leaving the general comprehensive plan of improvement for further study and later report.

At the time of the submission of the district officer's first report the city of Chicago was investigating the question of establishing a harbor on the lake front. The plans of the city, which have since been outlined, contemplate the establishment of such a harbor just north of the Chicago River, as shown on accompanying map, the first step proposed being the construction of two of the five piers, which, when ultimately built, will constitute "Harbor District No. 1." As stated in communications received from the mayor of Chicago and the commissioner of public works, the people of Chicago have voted a bond issue of $5,000,000 for this purpose. For the protection of these piers it is desired by the local interests that the United States extend the present exterior breakwater westerly from its northern terminus to a point on the shore at or near the foot of Oak Street, leaving a small opening therein, and southerly from its southern terminus. The district officer estimates that these extensions will cost $333,695 and $877,500, respectively, or a total of $1,211,195.

In the opinion of the Board of Engineers for Rivers and Harbors, it is advisable for the United States to undertake this improvement at the cost stated, the extensions of the breakwater not to be commenced, however, until it is apparent that the city's program will be carried out.

Protest has been made by local interests against having the northern arm connect with the shore line, on account of the damage to the adjacent residence property, and requests have been made that an opening of about 600 feet be left somewhere as a northern entrance for small boats moving along the shore front; but in the opinion of the board this is a detail of construction which should receive further study before the final plans are adopted.

In view of the fact that the city of Chicago has now definitely adopted a reasonable plan of harbor improvement at the mouth of the Chicago River, entailing large city expenditures to be paid for by means of authorized bond issues, and that such plan is easily susceptible of adaptation to further improvement of either the inner river or the outer harbor, or both, the Chief of Engineers fully indorses the views of the Board of Engineers for Rivers and Harbors that the Federal Government, while discussing the best plan for other places, should at this locality assist the city by extending the existing breakwater at both ends sufficiently to give adequate protection to the new city piers, and by beginning actual construction of such work just as soon as the city begins its own construction work upon these piers.

I have therefore, in carrying out the instructions of Congress, to report as follows: That the improvement by the United States of "Harbors and rivers at or near Chicago, Ill.," is deemed advisable immediately so far as to secure on the lake front at the mouth of Chicago River an outer harbor behind the existing exterior breakwater by means of extensions of this breakwater in the manner stated above at an estimated cost of $1,211,195, this estimate being based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of $350,000 in cash, accompanied by contract authorizations to cover the rest of the work with a view to its completion in three years.

Further report will be submitted later to cover my recommendations as to the rest of the plan for a complete, systematic, and broad improvement of harbor facilities for this locality as required by the full provisions of the act of March 3, 1909.

Very respectfully,

W. H. Bixby,
Chief of Engineers, United States Army.

The Secretary of War.

CHICAGO RIVER, ILL.

This river constitutes the inner harbor of Chicago. The navigable portions are wholly within the limits of Cook County and of the city of Chicago. Originally it was a sluggish bayou or creek nearly stagnant for the greater part of the year. The total length of the main river and its branches is about 20 miles. The portions of the river under improvement by the United States to a depth of 21 feet have lengths as follows:

	Miles.
Main river from end of harbor piers to junction of North and South Branches	1.58
South Branch, to Ashland Avenue	4.08
South Fork of South Branch, to Chicago Junction railroad bridge (east arm)	1.58
North Branch, to Belmont Avenue	5.00
North Branch Canal (Goose Island cut-off)	1.04
Total	13.28

Before improvement by the United States (1896) the river channel, as a result of municipal and private improvements, was navigable for about 14-foot draft boats over widths of about 200 feet throughout the length of the main river about 1.5 miles, and of use by boats of 12 to 14 feet draft for lesser widths and for about 5 miles farther length in the North Branch and about 5 miles farther length in the South Branch and forks.

There has been expended on previous projects $1,028,650.60, of which $109,462.55 was for maintenance.

The existing project was adopted by Congress in the river and harbor act March 2, 1907, which appropriated $300,000 for improvement and maintenance of this river; such work being covered by the survey report of November 14, 1899, and providing for dredging to 21 feet actual depth in mid-channel and to within 20 feet of dock lines from Ogden Slip at the river mouth to Ashland Avenue on the South Branch, to the Indiana State line (Chicago Junction Railway) bridges on the South Fork, South Branch, and to Belmont Avenue on the North Branch (including also the canal around Goose Island, North Branch), all originally estimated at $810,600. Project covering the work to be done was approved April 11, 1908, as follows:

(*a*) Dredging soft material, main river, North Branch (including canal), South Fork of South Branch, 1,472,000 cubic yards	$384,000
(*b*) Excavation rock and hardpan in North Branch and South Fork, 105,000 cubic yards	352,800
(*c*) Superintendence and inspection	73,800
	810,600

The division of funds between dredging and excavation being subject to modification during the progress of work.

There has been expended on the present project, approved April 11, 1908, to June 30, 1912, $555,130.75, of which $11,143.22 was for maintenance.

The river and harbor act of February 27, 1911, made an appropriation of $34,000 for maintenance and authorized continuing contracts in the further sum of $142,600 for completion of the project, all of which remains to be appropriated.

The work of removing the rock and soft materials in the North Branch in the vicinity of Fullerton Avenue, which was in progress at the beginning of the year, was completed. Work was also in progress under a new contract which provided for the deepening of the channels in the North Branch to North Avenue and in the South Fork to Thirty-fifth Street, in order to restore, as far as permissible with available funds, the project depth of 21 feet in the river.

All the work contemplated in the projects for the improvement of this river has been completed or provided for in the contract except the deepening of the North Branch above North Avenue, in the South Fork above Thirty-fifth Street, and the docking of the North Branch turning basin.

The present condition of the channels, in the main river and its branches, is about as follows, except that more or less shoaling has probably occurred from the various sewers emptying into the river since the soundings of 1911:

In the Main Branch, from Rush Street to the junction of the two branches, there is an available channel of at least 21 feet.

In the North Branch, from the junction to Halsted Street, there is a channel of at least 21 feet; thence to North Avenue (now being dredged to 21 feet) there is from 19 to 20 feet depth. The greater portion of the turning basin is 21 feet deep. The shallow portions are about to be deepened. From North Avenue to Fullerton Avenue there is a governing channel, midstream, of from 17 to 18 feet, though in many stretches deeper—from 20 to 21 feet—but much shallower water is generally found along both sides; but in the rock section from about 100 feet below the bridge to about 1,600 feet above it the depth was made at least 22 feet to within 20 feet of existing docks during the year. From Fullerton Avenue to Belmont Avenue the midstream channel is generally from 16 to 17 feet in depth, decreasing in the vicinity of the latter avenue to between 12 and 13 feet.

In the North Branch Canal the depth from the south end of Goose Island to the turning basin is generally from 19 to 20 feet in midstream, with 2 to 3 feet shallower at the sides.

In the South Branch, from the junction to the South Branch turning basin, the depth is generally nowhere less than 21 or 22 feet, but generally from 24 to 26 feet in depth.

In the South Fork of the South Branch, from Fuller Street to the two railroad bridges at the stockyards, the depth is generally 18 to 19 feet, except in occasional stretches, where from 20 to 23 feet will be found, which is the case at the site for the Thirty-fifth Street bridge, where the rock has been removed by the city of Chicago (preparatory to the construction of the said bridge) to a depth of 23 feet below city datum. The stretch from Fuller Street to Thirty-fifth Street is to be deepened to 23 feet below city datum under existing contract.

The northerly portion of the turning basin has a depth of about 24 feet, but the southerly, or larger, portion has only 18 to 19 feet in depth below hydraulic grade.

The South Branch has been dredged by the sanitary district to a least depth of 26 feet to within 40 feet of the docks, except in some bridge draws.

The maximum draft that can be carried at mean low water is 20 feet through the main river and South Branch to the Sanitary District Channel except through certain bridge draws; 18 feet through the South Fork of South Branch; and in the North Branch (including North Branch Canal) 19 feet to North Avenue.

The water level has variations of about 6.5 feet from the highest known to lowest known water and an average of less than 1 foot per day. The river has a current from the lake toward the Sanitary

District Canal varying from nothing up to about 3 miles per hour, according to drainage diversion and lake seiches.

Current observations to determine the exact velocity of the current and of the quantity of water being diverted from Lake Michigan through the Sanitary Canal are now being made.

The annual commerce is now reported at about 4,200,000 short tons, the principal items being grain, lumber, coal, and salt (a good deal of commerce having, since 1897, gone to the Calumet River, and the present further improvement is now mainly needed to prevent further loss). There is quite a large local commerce carried in the Chicago River by lighters, of which no official record is kept.

The development of commerce on this river is greatly hampered by the many obstructive bridges crossing the stream.

The existence of this improved river is considered to be of great use in controlling freight rates.

It is proposed to apply the funds now available and those asked for toward the completion of the turning basins, and to the approved project for dredging.

A list of past survey reports will be found on page 601, Annual Report of the Chief of Engineers for 1906.

Reference to reports on examination and survey of West Fork of South Branch of Chicago River, ordered by the river and harbor act of March 3, 1905, will be found on page 608, Annual Report of the Chief of Engineers for 1906. A report on the same locality called for by the river and harbor act of March 3, 1909, was printed as House Document No. 392, Sixty-first Congress, second session. A new report on same locality was called for by the river and harbor act of June 25, 1910, and report thereon was submitted October 27, 1910, and a public hearing held by the Board of Engineers for Rivers and Harbors September 20, 1911, and will be transmitted to Congress during its next session.

Amount of continuing-contract authorization, act of Feb. 27, 1911	$142,600
Amount appropriated under such authorization	28,000
Amount yet to be appropriated	114,600
Amount (estimated) required to be appropriated for completion of existing project	114,600
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	50,000
For maintenance of improvement	10,000
Total	60,000

ILLINOIS RIVER, ILL.

The Illinois River is formed by the conjunction of the Kankakee and Des Plaines Rivers at a point in Grundy County, Ill., about 50 miles above La Salle, flowing in a southwesterly direction and emptying into the Mississippi River at Grafton, Ill., about 36 miles above St. Louis, Mo. The total length of the stream is 273 miles.

That portion of the river under improvement by the United States, from La Salle to the mouth at Grafton, Ill., 223 miles in length, is divided into two sections, viz: (*a*) "Below Copperas Creek" (general improvement), 137 miles, and (*b*) "From Copperas Creek to La Salle," 86 miles.

No appropriation has been made for nor work of improvement undertaken by the United States on the section of the river above La Salle, Ill., the present head of navigation for steamers. Such steamers could also reach the State park at Starved Rock, about 5 miles above La Salle, were it not for the existence of the Chicago, Burlington & Quincy Railroad bridge at La Salle, which is a fixed bridge of insufficient headroom for the passage of these boats. On complaint of the rivers and lakes commission of Illinois that this bridge is a serious obstruction to navigation a public hearing was held on June 4, 1912, resulting in a recommendation that the Chicago, Burlington & Quincy Railroad Co. be required to make certain alterations in said bridge, including a suitable draw span. From Starved Rock to Marseilles, a distance of about 19 miles, a draft of about 3 feet can be carried, but navigation at this point is stopped by a fixed dam across the river. Such navigation as passes between Chicago and the Mississippi River is through the Illinois & Michigan Canal from Joliet, Ill. (the terminus of the Chicago Sanitary & Ship Canal), to the Illinois River at La Salle, as described on page 179, Bulletin No. 21 (1912), issued by the United States Lake Survey Office, Detroit, Mich.

Improvement work is referred to Memphis datum, which is 587.04 feet below Chicago city datum, or 7.1 feet below New York mean tide.

On June 30, 1912, a minimum depth of 6 feet at mean low water was available throughout the length of the river under improvement; that is, from the month to La Salle. The available width is from 160 to 200 feet. The fluctuations in stage from low water to flood stage is upward of 15 feet.

Below Copperas Creek.—The project, which contemplates the extension of slack-water improvement begun by the State of Illinois from Copperas Creek Lock to the Mississippi River, and which includes the construction of two locks 350 feet long between sills, 75 feet width of chamber, with 7 feet of water over sills at low-water level of 1879, and dredging the channel where necessary to obtain 7 feet depth at low water, was adopted in 1880.

The lock and dam at Kampsville, Ill., 31 miles above the mouth of Illinois River, has been completed and in use since 1894, and that at La Grange, 79 miles above the mouth, since 1890.

The State of Illinois, aided by the United States, has executed part of the general project by the construction of locks and dams at Henry and Copperas Creek, completing, except dredging, that part of the project between La Salle and the mouth of Copperas Creek, a distance of about 86 miles, over which section the State of Illinois collects tolls.

Harbor lines on both sides of the river at Peoria have been established.

The United States has expended on this work to June 30, 1912, $1,571,249.15, of which $15,897.70 was expended during the fiscal year in dredging at miles 7, 8, 31, 160, and 162, maintenance of plant, supervision of river, and care of property and plant.

The improvement of Illinois River has been in progress many years, and the present navigable depth has obtained at ordinary stages of the river for several years, during which freight rates in the vicinity have decreased to some extent; but as freight rates generally have diminished during these years, it is impossible to state whether the effect of river competition is shown in diminished railroad freight rates. The closing of the river to navigation, however, would unquestionably lead to a rise in freight rates on the adjacent railways, and as the volume of freight affected would be large, a good navigable condition should be maintained.

There are many wagon bridges and railroad bridges across the river, and at Peoria the troughs of large distilleries discharge into the channel; these structures have been modified from time to time to meet the demands of navigation.

It is proposed to apply the available funds and those estimated for in maintaining the navigable channel of 7 feet depth, removing snags, care and repair of property and plant, and in making such local surveys as may from time to time be necessary, and the construction of a new dredge.

By the act approved June 25, 1910, Congress ordered a preliminary examination to be made between Hurricane Island and Calhoun County, for the purpose of providing a suitable channel. The report on this examination was submitted by the district officer and is now having consideration by the Board of Engineers for Rivers and Harbors, and it is expected that the report will be transmitted to Congress during the present session.

Amount (estimated) required to be appropriated for completion of existing project	$92,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	100,000

MISSISSIPPI RIVER—HEAD OF PASSES TO MOUTH OF THE OHIO.

The Mississippi River Commission, constituted by act of Congress of June 28, 1879, is in charge of the improvement of the Mississippi River from Head of Passes to the mouth of the Ohio River, including the rectification of Red and Atchafalaya Rivers at their junction with the Mississippi, the building of levees, and the improvement of the several harbors for which specific appropriations have been made, with the exception of the harbor of Vicksburg and the mouth of Yazoo River. It is also charged with the survey of the Mississippi River from Head of Passes to its headwaters, and with gauging the river and its tributaries.

The river and harbor acts of March 3, 1905, and March 2, 1907, prescribed that the money therein appropriated and authorized to be expended should be applied to the construction of suitable and necessary dredge boats and other devices and appliances and in the maintenance and operation of the same, with the view of ultimately obtaining and maintaining a navigable channel from Cairo down not less than 250 feet in width and 9 feet in depth at all periods of the year, except when navigation is closed by ice. They also authorized allotments from such funds in the discretion of the commission and upon approval by the Chief of Engineers, to be applied to the watercourses connected with the river and the harbors upon it now under the control of the Mississippi River Commission.

Act of Congress approved June 4, 1906, provides that any funds which have been, or may hereafter be, appropriated by Congress for improving the Mississippi River between the Head of Passes and the mouth of the Ohio River, and which may be allotted to levees, may be expended under the direction of the Secretary of War, in accordance with the plans, specifications, and recommendations of the Mississippi River Commission, as approved by the Chief of Engineers, upon levees upon any part of said river between the Head of Passes and Cape Girardeau, Mo.

The appropriations under continuing contracts authorized by the act of March 2, 1907, have been completed, and further appropriations are now being made annually, that of February 27, 1911, being for $3,000,000.

Emergency appropriations have been made by Congress during the past fiscal year, for expenditure under the commission, as follows:

Act of April 3, 1912 (Public, No. 112), appropriated $350,000 for the purpose of maintaining and protecting against impending floods the levees on the Mississippi River. This act was amended by joint resolution of April 9, 1912 (Public Resolution, No. 25), so as to make the appropriation available for the purpose of maintaining and protecting against impending floods the levees on rivers tributary to the Mississippi River.

Act of April 16, 1912 (Public—No. 122), appropriated $300,000 for the purpose of maintaining and protecting against the impending flood the levees on the Mississippi River and rivers tributary thereto.

Joint resolution of April 30, 1912 (Public Resolution—No. 30), appropriated $1,500,000 for rebuilding such portions of the levees on the Mississippi River and its tributaries as may have been or may hereafter be broken by the existing flood in said rivers or so materially weakened as to necessitate rebuilding, and provided that so much of this appropriation as might be expended should be deducted from the appropriations that shall first hereafter be made for improving the Mississippi River from Head of Passes to the mouth of the Ohio River.

The commissioners during the fiscal year were Col. C. McD. Townsend, Corps of Engineers, president from February 6, 1912; Col. William T. Rossell, Corps of Engineers, who acted as president until February 6, 1912; Col. J. G. Warren, Corps of Engineers; Homer P. Ritter, assistant, United States Coast and Geodetic Survey; Robert S. Taylor; J. A. Ockerson; and C. H. West.

Lieut. Col. Charles L. Potter, Corps of Engineers, was on duty as secretary of the commission during the fiscal year.

Estimate for the fiscal year ending June 30, 1914.—The following estimate of funds required for carrying on the works under charge of the Mississippi River Commission for the year ending June 30, 1914, is submitted:

For continuing the improvement of Mississippi River from Head of Passes to the mouth of the Ohio River, including salaries and clerical, office, traveling, and miscellaneous expenses of the Mississippi River Commission	$6,000,000

The report of the commission on the operations under its charge during the fiscal year ending June 30, 1912, is submitted herewith.

For detailed report, see Report Chief of Engineers, 1912, part 3, pages 3965–3988.

MISSISSIPPI RIVER BETWEEN OHIO AND MISSOURI RIVERS.

In its original condition, prior to any improvement, the navigable channel of this section of the Mississippi River had a natural depth in many places of only 3½ to 4 feet at low water. The main channels were divided by islands and bars, which formed chutes, sloughs, and secondary channels, through which a considerable part of the volume of the flow was diverted, to the detriment of navigation.

The first systematic effort to improve this condition was begun by the Federal Government in 1872, and was continued for a number of years as appropriations were made, the works of improvement consisting of dikes and dams of brush and stone to confine the low-water volume to a single channel and of revetments to hold and preserve the banks where necessary or advisable.

The project followed in later years to the present time has been practically that adopted in 1881, approved by letter of the Chief of Engineers dated March 31, 1881, which sought to obtain eventually within the district, at standard low water, a minimum navigable channel depth of 6 feet above St. Louis and 8 feet below that city by confining the flow of the river to a single channel having an approximate width of 2,500 feet at bank-full stage, the natural width in many cases being a mile or more at mean high water, this result to be secured by closing sloughs and secondary channels and by building out new banks where the natural width is excessive, using for the purpose permeable dikes or hurdles of piling to collect and hold the solid matter carried in suspension or rolled on the bottom by the river, the banks, both new and old, to be revetted or otherwise protected where necessary to secure permanency. Modifications of the project in the river and harbor acts of 1896 and 1902 provided that, pending the completion of the permanent improvement, the required low-water channel depth should be maintained each season by the use of dredges and other temporary expedients.

The river and harbor act of March 3, 1905, radically changed the project by limiting work of improvement to dredging only, adopting one of the recommendations of the board of engineers, November 12, 1903, to the exclusion of the others. The recommendation of the board fixed the channel depth to be obtained at 8 feet for the river reach below St. Louis, with a minimum width of 200 feet.

This change in plan was modified by joint resolution of Congress, June 29, 1906, authorizing, after all dredging expenses were provided for, the application of the balance of funds remaining to the credit of the appropriation of 1905 to the repair or completion of improvements under the former projects or to the construction of other works useful to navigation.

The river and harbor act of March 2, 1907, confirmed the change of plan to dredging and temporary expedients as principal means of channel improvement and limited expenditure for works of permanent character, first, to the maintenance and repair of works already constructed, and thereafter, with any funds remaining, to the construction of other works of channel regulation; but the small amounts appropriated yearly under this act almost precluded extension of the existing system of permanent works.

The river and harbor act approved June 25, 1910, restored the plan adopted in 1881, together with dredging, as the plan to be followed in prosecuting the improvement, with a view to its completion within a period of 12 years.

The report of the special board on examination and survey of the Mississippi River from the Lakes to the Gulf, March 20, 1909, which virtually recommended the early completion of the 1881 project as indorsed and modified by the 1903 board, put the cost of such completion at $21,000,000, in addition to all amounts already expended. Of this sum $2,750,000 has been appropriated in the river and harbor and sundry civil acts of 1910, 1911, and 1912, leaving the balance yet to be appropriated $18,250,000.

The object of the previous and present plans of improvement is, therefore, to obtain and maintain a minimum depth at standard low water of 6 feet from the mouth of the Missouri to St. Louis and of 8 feet from St. Louis to the mouth of the Ohio.

The total amount appropriated to June 30, 1912, is $14,894,999.98, of which $180,000 was allotted by acts and projects for improvement between the mouths of the Illinois and Missouri Rivers, including Alton Harbor, $10,000 was allotted for Wittenberg, Mo., and $1,400,000 was for methods of improvement under the acts of 1905, 1907, 1908, and 1909.

The total amount expended to June 30, 1912, for improvement between the Ohio and Missouri Rivers, project of 1881, is $13,364,269.50.

The $10,000 for Wittenberg, Mo., was carried to the surplus fund.

The balance unexpended June 30, 1912, is $22,680.52.

The result of the expenditure of this amount has been the partial permanent improvement of the entire extent of the river from St. Louis to Cairo, and during recent years practically the maintenance of the channel depths required.

The improvement has probably had a beneficial influence on freight rates, as the rates to localities reached by water are well known to be lower than those remote from this advantage, but an accurate estimation of such effect is impracticable.

The new appropriation asked for is the estimated expenditure for one years only, and should be followed by such amounts annually as will permit the completion of the improvement within the period specified.

It is proposed to expend the new appropriation asked for in such permanent and temporary improvements as may be necessary and are authorized.

The amount expended by vouchers and by the auditor during the fiscal year ending June 30, 1912, was $978,055.12, which includes $18,322.63, expended for other appropriations for which reimbursements are pending, leaving $959,732.49 expended on the improvement; for dredges and dredging, care and increase of plant, and for maintenance and repair of existing works of revetment and contraction, and for the extension of such works of both kinds, in pursuance of the project referred to.

During the past year the river stages have been favorable, and there was maintained a channel depth of 8 feet below St. Louis during the entire season when the river was unobstructed by ice, except for very short periods at two places where the depths were reduced to 6 feet until dredges could be brought into action, when the required depth was quickly obtained.

At Grand Tower, Ill., natural silting up and closing of the chute east of Grand Tower Island had forced the boat channel to the west of that island over a bar of gravel and bowlders which could not be moved by the suction dredges in use. A channel 200 feet wide, down to a depth of 3 feet below the zero of the Grand Tower guage, had been made across this bar under contract during the fiscal years 1910–11, but during the abnormally low-water season of 1910, this channel proved to be of insufficient width and depth on account of outcropping bowlders, and it was decided to widen the channel to 300 feet and deepen it to 5 feet below the zero of the guage. The enlarged channel was about one-half completed during the fall season, using a dipper dredge borrowed from the Rock Island engineer district.

During the fiscal year the river at St. Louis reached a high-water stage of 26.8 feet above standard low water (4 feet, St. Louis guage) April 6, 1912, and a low-water stage of 2.0 feet below standard low water on January 8, 1912.

With the present appliances and works of permanent improvement, it is expected that a navigable depth of about 8 feet will be maintained between St. Louis and Cairo during all stages of river open to navigation.

Amount (estimated) required to be appropriated for completion of existing project	$18,250,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	1,000,000

MISSISSIPPI RIVER BETWEEN MISSOURI RIVER AND MINNEAPOLIS, MINN.

Between Missouri River and St. Paul, Minn.—Under this head is carried on the improvement of through navigation and also such special harbor or levee work as is provided for by Congress. Systematic work was begun in 1878, and such good results have been secured as to demonstrate that with a continuance of operations under liberal appropriations the low-water channel of the Mississippi River between St. Paul and the Missouri River can be made sufficiently deep, available, and permanent to satisfy the demands of commerce.

The general direction of flow is south; the distance from St. Paul to the Missouri River, the limits of the project, is by low-water channel about 658 miles, and the distance from the mouth of the Missouri to the Gulf of Mexico about 1,275 miles.

The original condition of the channel between the Missouri River and St. Paul was such that in low stages the larger boats were unable to proceed farther upstream than La Crosse or Winona, and in many seasons at points much lower down their progress was checked or seriously hindered.

The original project for the improvement, adopted in 1879, proposed the contraction of the channel or waterway by means of wing and closing dams to such an extent as, by means of the scour caused, to afford a channel of sufficient width and of a depth of 4½ feet at low water. There was expended under the original project and the provisional project of 1897 to June 30, 1911, $12,108,965.40, of which about $750,000 was applied to maintenance. At that date and for many years previous the condition of the channel was such as to permit the passage of the largest river boats at very low stages to St. Paul. It should be noted that of the amount above stated $1,062,000 has been expended for harbors and levees not connected with through channel improvement.

The existing project, for the purpose of ultimately securing and maintaining a depth of 6 feet, was adopted by Congress March 2, 1907, and is given in full with detailed estimate in House Document No. 341, Fifty-ninth Congress, second session. It provides for further contraction of the channel, for rock excavation, for auxiliary dredging, for further improvement of the Rock Island Rapids by lateral canal and rock excavation, for repairs to existing work, and maintenance during construction. The estimate of cost is $20,000,000, and for care and maintenance after completion $300,000 per annum.

The river and harbor act of June 25, 1910, provided that this improvement should be prosecuted with a view to its completion within a period of 12 years.

No change has been made in this project since its adoption.

During the past year work in construction of dams and shore protection has been carried on by hired labor and use of Government plant between Alma and Fountain City, at Zumbro River, vicinity of Winona, Trempealeau, Richmond, and Dakota, at La Crosse, vicinity of Dubuque, Nine Mile Island, and Bellevue, at or near Clarksville, Taylor Island, Cincinnati Landing, and Mundys Landing, and above Grafton.

By hired labor dredging was done at a very large number of localities, and rock excavation was carried on in Moline pool and at Rockingham and Horse Island. Under formal contract, construction work was performed in vicinity of Wabasha, McGregor, Cassville, Spechts Ferry, Dubuque, Linwood, Buffalo, Montpelier, Pine Creek, Flint Creek Levee, Turkey Island, Becks Landing, and Churchs Landing. The total expenditure for above work was $1,121,418.39.

To June 30, 1912, the amount expended since the 6-foot project was adopted was $3,404,186.10, of which $3,174.47 was for maintenance.

At all localities where work was performed, good results were obtained.

With the expenditure during the past year an increased depth was obtained at several localities.

Needed repairs were made to dams and shore protections broken, settled, or otherwise damaged.

The maximum draft that could be carried June 30, 1912, from the Missouri River to St. Paul, 658 miles, at mean low water (stage 1.5 above extreme low water) was, as nearly as could be ascertained, 4.5 feet.

About 16 per cent of the approved project has been accomplished June 30, 1912.

The navigation interests are important, although much less than in former years, owing to the decrease in the handling of logs and the manufacture of lumber. The amount of freight carried during the season of 1911 was about 2,081,566 short tons, having an approximate value of $38,928,961, the tonnage being 12 per cent and the valuation 90 per cent greater than in 1910.

The amount required for expenditure in fiscal year ending June 30, 1914, is to be used in the continuation of improvement work in accordance with the 6-foot project adopted by Congress March 2, 1907, for the purpose of extension of benefits of navigation. It is the estimated expenditure for one year only.

Freight rates charged by rail and river from St. Louis to several points on upper Mississippi River on classes 1–5, western classification.

[In cents per 100 pounds.]

To—	By rail.	By river.	1		2		3		4		5	
			Rail.	River.	Rail.	River.	Rail.	River.	Rail.	River.	Rail.	River.
	Miles.	*Miles.*										
St. Louis	0	0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Quincy	140	155	35	28	28	22.5	22	17.5	15.5	12.5	12.5	10
Keokuk	178	192	37	30	31	25	23	18	16.5	13	13	10
Fort Madison	202	213	39	30	32	25	24	18	17	13	14	10
Burlington	222	234	39.6	30	32	25	24.8	18	18	13.5	15.9	11
Rock Island	249	313	40.7	33	32.9	26	25.6	20	20.5	15	16.4	12
Clinton	287	349	42.8	33	34.7	26	27.1	20	21.7	15	17.3	12
Dubuque	347	411	45.9	33	37.6	26	29.7	20	23	15	18	12
La Crosse	461	532	50	34	42	28	33	22	23	16	18	12
Winona	488	560	50	34	42	28	33	22	23	16	18	12
St. Paul	576	676	60	40	50	34	40	27	25	17	20	14

It will be noted that the water rates are about 66 per cent of the rail rates. While it is not claimed that river improvements are solely responsible for the great difference in freight rates as shown, it is well known that wherever water competition exists, whether by river, canal, or lake, its effect on freight rates is always beneficial to the public, and that so long as the navigation of the Mississippi River is feasible, and largely in proportion to its feasibility, such benefits will accrue, even if but little river commerce is actually carried on.

It is well known that the railroads strive keenly for the north-and-south freight business, make much lower rates where there is water competition, cut their rates on certain commodities, and, it is reported, make sometimes especially low rates for the season of navigation, to be increased during the winter months. This latter practice was common several years ago.

A thorough classification of the freight carried by steamboats in 1911 was found impracticable, and a reliable statement of amount saved can not be given, the question being further complicated by the fact that a great part of the freight was package freight carried at arbitrary rates. It is to be remembered that benefit also accrues to the public in the reduction, due to the river, of rates on freight carried by rail, the amount of which freight, although not definitely known, is thought to be very much greater than that carried by boats.

The continued prosecution of the improvement to a greater extent than in recent years seems advisable, in order that the condition of the river for through navigation may be maintained and more rapidly improved. It is not anticipated that any further material reduction in freight rates on the adjacent railways will thus be had, but there would otherwise be danger that any lessened efficiency of the river for navigation would soon result in an increase in freight rates, and the volume of freight that might thus be affected is so great that a very small increase on these rail rates would annually exceed in total amount the recent annual appropriations for the portion of the Mississippi River in question.

The total quantity of freight transported on the upper Mississippi River within the limits of this district during the calendar year 1911 was about 2,081,566 short tons, and the ton-miles 149,151,826. In 1910 these quantities were 1,830,000 short tons and 106,039,260 ton-miles. The increase in freight tonnage in 1911 is entirely due to the increase in the Government work in towing material, other items of freight traffic remaining about the same as in 1910.

Winter work was continued with satisfactory results, being confined to localities not readily reached with boats and barges during the open season.

For dredging in harbors and at landing places and maintenance of United States levees, the river and harbor acts of June 25, 1910, and February 27, 1911, each provided $75,000. From the provision in the former act allotments have been made for dredging at Alton Slough, at Quincy Bay and Harbor, at Burlington, Rock Island, Moline, Lake City, and Stockholm, and for protecting the river banks adjacent to portions of the Flint Creek–Iowa River Levee. The amount expended during the past fiscal year is $23,130.40, and to June 30, 1912, including expenditures 1907–1910, $125,205.92.

The river and harbor act of July 25, 1912, makes an appropriation of $1,250,000 for continuing the improvement and for maintenance in accordance with report printed as House Document No. 341, Fifty-ninth Congress, second session, for the purpose of securing and ultimately maintaining a depth of 6 feet, and with a view to completing the improvement within a period of 12 years from June 30, 1910, and also provided that of the amount appropriated, $25,000 may be expended for the repair and maintenance of existing levees constructed by the United States.

Amount (estimated) required to be appropriated for completion of existing project	$15,000,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	1,500,000

MISSISSIPPI RIVER BETWEEN ST. PAUL AND MINNEAPOLIS, MINN.

The Mississippi River has its source in Lake Itasca, in the northern part of the State of Minnesota, and flows in a southerly direction to the Gulf of Mexico, its length being about 2,440 miles. It is navigable for steamboats in one stretch from its mouth to St. Paul, a distance of about 1,940 miles.

The section included in this improvement extends from the Chicago, St. Paul, Minneapolis & Omaha Railway bridge in St. Paul to Washington Avenue Bridge in Minneapolis, 11.4 miles. Before improvement, boats drawing 3 feet could go up at ordinary low water as far as the mouth of the Minnesota River, 2.66 miles above the Chicago, St. Paul, Minneapolis & Omaha Railway bridge. From the Minnesota River to the present site of Dam No. 2, a distance of 6.56 miles, there was a channel about 2½ feet deep; but on account of the velocity of the current, upstream freighting was difficult and unprofitable. From this point to the Washington Avenue Bridge, a distance of 2.18 miles, the depth was not more than 2 feet at ordinary low stage, and the velocity such as effectually to prevent navigation. Before 1894 work was done in this part of the river under allotments from the appropriations for "Improving the Mississippi River from the landing on the west bank below the Washington

Avenue Bridge, Minneapolis, to the Des Moines Rapids." A total amount of $59,098.70 was thus expended in dredging, bank protection, and construction of wing dams. As a result considerable improvement was made in the navigable reaches, but the limits of navigation were not extended.

In 1894 a separate project was adopted for the Mississippi River between St. Paul and Minneapolis. It provided for two locks and dams—one (No. 1) just above the mouth of Minnehaha Creek, and 3.68 miles above the Minnesota River, to have a lift of 13.3 feet; another (No. 2), 2.88 miles above No. 1 and 2.18 miles below Washington Avenue Bridge, Minneapolis, to have a lift of 13.8 feet. The lock chambers were to be 80 feet by 334 feet, and the depth on the lower miter sills 5 feet at low water.

This project was modified by the act of March 2, 1907, which required a channel depth of 6 feet instead of 5 feet. This involved an increase in the lift of the two dams and an increase in the depth on the lower miter sill of Lock No. 1 to 6 feet at low water.

The river and harbor act approved March 3, 1899, authorized the completion of Lock and Dam No. 2 and the construction of Lock and Dam No. 1, under continuing contracts or otherwise, at a total cost, for both locks and dams, of $1,166,457. An increase in the limit of cost to $1,466,000 was authorized by the river and harbor act approved March 3, 1905. This act authorized continuing contracts for the completion of the work in the sum of $299,543, all of which has been appropriated.

The amount expended under this project to June 30, 1912, was $1,162,592.97, of which $2,792.43 was for maintenance.

The project was further modified by the river and harbor act approved June 25, 1910, in accordance with recommendation contained in House Document No. 741, Sixty-first Congress, second session. As it now stands Lock and Dam No. 1, instead of being completed with the lift originally intended (13.3 feet), are to be given a lift of about 30 feet. This will give a depth of 9½ feet at Washington Avenue Bridge in Minneapolis and provide for the development of power, and implies the abandonment of Lock and Dam No. 2.

The modification of the project involves an increase in the estimated cost over that of the project of 1905 of approximately $635,000. This amount includes, however, $180,000 for flowage rights, some of which may be acquired without cost to the United States.

Before the project was last modified (June 25, 1910) Lock and Dam No. 2 had been completed and in operation since May, 1907. The masonry of Lock No. 1 had been completed as then authorized, but no work had yet been done on Dam No. 1.

Until the completion of Lock and Dam No. 1 the work can not have much beneficial effect on the navigability of the river.

During the year the lock walls were built up to the required height on the land side and on about three-quarters of the river side. The lower miter sill was removed and rebuilt about 5½ feet lower. The portion of the dam included in the lock cofferdam inclosure (about 48 feet in length) was built. Excavation was completed and work commenced on the power-house foundation. The project is about 46 per cent completed.

The expenditure on the modified project to June 30, 1912, was $367,707.20. The maximum draft that could be carried on June 30, 1912, from St. Paul to Minneapolis was 2 feet, the river below Dam No. 2 being 1.3 feet below the mean low stage during navigation season (3 feet on the St. Paul gauge).

The usual variation of level of water surface is about 8 feet, with a maximum variation of about 16 feet.

The head of navigation for large boats now is the mouth of the Minnesota River, 2.7 miles above the Chicago, St. Paul, Minneapolis & Omaha Railway bridge in St. Paul. The reach from the mouth of the Minnesota River to Minnehaha Creek, a distance of 3.3 miles, is regularly used by light-draft excursion boats.

At the present time the principal commerce is the passage of logs, loose and rafted. During the calendar year 1911, 9,000,000 feet b. m. of logs, approximately 40,000 short tons, with an estimated value of $200,000, were floated down the river. The excursion business amounts to about $10,000 per annum.

The construction of the lock and dam may develop a passenger traffic between St. Paul and Minneapolis, and is expected to reduce the freight rate on flour and grain shipped from Minneapolis.

It is proposed to expend the amount required for expenditure during the fiscal year 1914 in completing the construction of the dam.

Amount (estimated) required to be appropriated for completion of existing project	$185,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	185,000

MISSOURI RIVER FROM KANSAS CITY TO THE MOUTH.

The original condition was one of varying widths and depths. The width varies from 800 feet to 1 mile or more. In the deep reaches the width is 800 to 1,500 feet, and the low-water depth often over 12 feet. In the wide reaches the channel divided into numerous chutes, thus reducing the available depth to about 3½ feet to 4 feet at low water. The banks of the river are alluvial and are continuously eroding, and the channel is changing except where protected by revetments and dikes or by natural bluff contacts. The river was also obstructed by many snags.

The present condition is generally similar to the original, except that snags are fewer, and the reaches of deep water are longer and better, due to river regulation and improvement.

The river has been navigated by steamboats since 1819.

Lenth of entire river from Three Forks to mouth, 2,551 miles. General course southeast.

Length of section, Kansas City to mouth, 392 miles. General course east. Head of navigation, Fort Benton, Mont., 2,285 miles above mouth.

The Missouri River Commission was in charge from 1884 to 1902, and undertook various systematic improvements. The effort of the commission in its work below Sioux City was to accomplish a continuous, progressive control of the river, contracting it where necessary, giving the channel proper direction, and securely holding it in place. Work in this direction was done in the vicinity of Kansas City and on the first reach of the river, which extends from near Jefferson City to the mouth. On 45 miles of this reach a continuous channel of not less than 6 feet in depth at low water was obtained on what was originally one of the worst parts of the river, in the vicinity of the mouth of the Osage. In addition to forming a channel, much new land was formed and much land protected from destruction by the river. The greater part of the funds appropriated for expenditure under the direction of the commission was not applicable to the comprehensive plan adopted, and about one-third was diverted to work at separate localities.

The total expenditures to date, from all appropriations made prior to June 25, 1910, amount to $7,227,934.12.

The existing project provides for securing a permanent 6-foot channel between Kansas City and the mouth of the river in accordance with report submitted in House Document No. 1287, Sixty-first Congress, third session, with a view to the completion of such improvement within a period of 10 years. Date of adoption by Congress, river and harbor act of July 25, 1912, which also appropriates $800,000 for continuing work. Estimate of cost, $20,000,000. Time of completion, 10 years. Work proposed, the regulation and contraction of channel by means of revetment and dikes, with a view to securing a permanent 6-foot channel, assisted by removal of snags.

No modification of existing project has been made. Work has been carried on in accordance with the approved project of July 25, 1912, practically since the appropriation of June 25, 1910.

The work of the past year has been carried on from funds as follows, which covers all the appropriations to June 30, 1912, for the existing project: River and harbor act of June 25, 1910, $1,000,000.

In addition to the above the sundry civil act of August 24, 1912, appropriated $600,000 in pursuance of authorization contained in the river and harbor act of February 27, 1911.

The least depth over the improved reaches at low water is 6 feet. The usual variation of water level at Kansas City is 19 feet, and at St. Charles 25 feet. The maximum through draft at low water is 4 feet.

Elevations referred to St. Louis directrix.

	Kansas City.	St. Charles.
Standard low water	308.67	7.09
Standard high water	323.19	23.22

The effect of the improvement has been to equalize and keep down freight rates, the actual river rates being about 66⅔ per cent of the rail rates.

At the close of the present calendar year there will be about 20 miles of river bank completed, besides the new work begun with the $800,000 appropriated this year. The present season has been unfavorable on account of continued high water. Maintenance and repair work was also constructed during the year.

Since the adoption of project and beginning with the appropriation of June 25, 1910, there has been expended for snagging and maintenance of works a total of $83,141.87.

The work at Waverly, Providence, and Missouri City Bends is being constructed under continuing contract appropriation of $600,000, authorized February 27, 1911.

The proportion of the approved project accomplished to June 30, 1912, is 6 miles, or 1.5 per cent. By the close of this season it is expected the total completed will be about 5 per cent. Where these revetments have been placed the channel has become fixed and of a greater depth. In general, the depth along a revetted bend is 6 to 10 feet and is free of snags and obstructions. The maximum through draft has not been increased, though the length of the improved channel has increased in proportion as the work progresses.

Freight traffic, season of 1911, March to December.

Articles.	Amount (customary units).	Amount (short tons).	Valuation.	Average haul.	Rate per ton-mile.
				Miles.	
Grain	152,269 bushels	4,559	$117,110.98	49	$0.0132
Hay		86	1,144.00	8	.0918
Feed and flour		125	6,101.70	8	.0872
Coal		651	2,085.00	2	(1)
Oil	44 barrels	12	351.65	8	.0781
Manufactured iron and steel		865	81,310.00	134	.017
Live stock	2,649 head	1,158	69,230.00	8	.0739
Salt	149 barrels	22	222.60	8	.0551
Sand and gravel	1,408 cubic yards	2,047	1,376.10	6	.0656
Brick	14,125	32	113.00	10	.0879
Cement	453 barrels	91	453.00	8	.0808
Lumber	266,255 feet b. m	655	7,610.00	10	.0265
Other building material		6	53.96	8	.0552
Railroad ties	151,062	9,064	89,262.60	15	.0111
Produce		168	31.046.90	8	.0939
Wood	1,070 cords	1,511	3,512.25	17	.0476
Miscellaneous		1,035	121,095.00	277	.0143
Logs and lumber, rafted	21,700 feet b. m	48	260.40	100	(1)
Sand and gravel, barged	219,291 cubic yards	284,177	68,627.15	2	(1)
Riprap, willows, and lumber used by private parties for bank protection.		1,500	1,500.00	5	(1)
Total		307,807	602,466.23		

Owner.

In high-grade commerce there has been a decided increase; the apparent reduction is in hauling sand. Total mile tonnage for the year was 1,401,805 ton-miles.

The commerce of this section of the river is now in process of change and increase. The Kansas City-Missouri River Navigation Co. has been organized with a capital of about $1,200,000. The first boats of the new company were run during 1911, but actual operations began late in season, and many new features as to navigation, wharfage, terminal transfers, etc., were worked out.

The company has three steel-hull towboats, five barges, and several smaller craft. The combined tonnage of the five barges per foot of immersion is 860 tons. A creosoted pile wharf, 500 feet in length, has been constructed at Kansas City, and a terminal warehouse, 306 feet by 40 feet, built on the wharf, arranged with a locomotive crane and telepherage system of handling freight. This is probably the most complete inland river transfer wharf in the United States. The tonnage handled this season, from May 7 to June 30, aggregates over 1,000 tons for a distance of about 400 miles, or 400,000 ton-miles. Most of this freight was high-class merchandise.

The company also has a warehouse and wharf at East St. Louis, Ill., and is arranging with the towns on the Missouri River between Kansas City and the mouth for local freight landings. The effect of this revival of commerce has not actually reduced the rail rates, but it is believed such will be the case. The boat rates now in force are about 66⅔ per cent of the rail rates.

The amount estimated as a profitable expenditure for fiscal year 1914 will be applied to continuing work on the approved project.

During the past year a good start has been made on the project as adopted by the river and harbor act of July 25, 1912. There are now in force the following works:

	Linear feet.
By contract:	
Standard revetment	78,000
By day labor:	
Standard revetment	5,000
Concrete and willow mattress revetment	12,000
Concrete 3-row dike	4,500

These works will all be finished or well along by January 1, 1913. The funds appropriated by the act of July 25, 1912, $800,000, will be applied to new works of revetment, dike, snagging, and new plant, and should all be under contract or in force by day labor before the summer is far advanced. In addition to the above, 13,068 linear feet of revetment under the approved project has been completed.

Of the 392 miles of river, about 180 miles have been surveyed, and during the present summer an additional 60 miles is contemplated. The combined concrete and willow mattress revetment, as constructed at Gasconade, has proven very satisfactory, and additional similar work on a large scale is now under construction.

The concrete pile dikes, as previously constructed at St. Joseph, Mo., and Fort Riley, Kans., have given sufficient experience to adopt a fairly permanent standard, and 4,500 linear feet of 3-row concrete dike will accordingly be undertaken during the coming season.

Investigation is now under way to devise a lumber mattress in case there should be a shortage of willows in several years.

Amount of continuing contract authorization, act of Feb. 27, 1911	$600,000
Amount appropriated under such authorization	600,000
Amount (estimated) required to be appropriated for completion of existing project	17,600,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	2,100,000

MISSOURI RIVER, KANSAS CITY TO FORT BENTON.

The extreme upper portion from Fort Benton to Carroll, 172 miles, is known as the Rocky River, and on this stretch there are well-defined pools and shoals. From this point down the river gradually assumes, and at Sioux City reaches, its full alluvial character. In the middle and lower reaches of this section it is of varying depths and widths, quite similar to the portion from Kansas City to the mouth, and is obstructed by snags. Where regulation has been carried on and the width reduced, good navigable depths are found, but the maximum low through depth to Sioux City is about 3½ feet, and from there to mouth of Milk River about 3 feet, and from thence to Fort Benton falling as low as 2 feet, when the minimum stage is reached.

The present condition is in general similar to the original, except that snags are fewer and the depths better and over longer portions, due to river improvement.

The improvements heretofore carried on in this section of the river have consisted in dike and revetment work and snagging. The most systematic work has been carried on near St. Joseph, Mo., and just above Kansas City.

This section of the river has been navigated by steamboats to Council Bluffs since 1819; to mouth of Yellowstone, 1832; to Fort Benton, 1859.

Length of entire river, Three Forks to mouth, 2,551 miles. General course, southeast. Length of section, Kansas City to Fort Benton, 1,893 miles. Distance of lower end at Kansas City above mouth, 392 miles.

From 1884 to 1890 the work was under the Missouri River Commission.

On the upper portion of the river the work originally consisted mainly in improving the shoals and rapids on the so-called "Rocky River" from Fort Benton downstream for 150 miles. In recent years it has largely been limited to channel regulation and bank protection at the following points: Fort Benton and Judith, Mont.; Williston, Expansion, Deapolis, and Bismarck, N. Dak.; Pierre, Yankton, and Elk Point, S. Dak.; and Sioux City, Iowa. Two ice harbors have been established, one at Rockhaven, N. Dak., the other in the mouth of the Big Sioux River, just above Sioux City.

Works of channel regulation have also been built in the Long Pool, or the reach of the river from the crest of the Great Falls to Cascade, and a small amount of open-river work in the steeper stretch from Cascade to Stubbs Ferry.

The total appropriations to date amount to $5,325,504.65, of which $2,547,046.52 approximately pertain for Kansas City to Sioux City, and $2,778,458.73 Sioux City to Fort Benton.

There is no approved project for the portion, Kansas City to Sioux City. The river and harbor act of July 25, 1912, appropriates $75,000 for improvement and maintenance for Kansas City to Sioux City, and for Sioux City to Fort Benton, $150,000 for improvement and maintenance in accordance with report submitted in House Document No. 91, Sixty-second Congress, first session.

Since the work or project is indefinite, no proportion of completed amounts can be given for this section of river as a whole.

Regarding improvement to navigation, there has been a benefit at and along the shores protected, but the maximum through depth remains the same.

Elevations above sea level.

[Feet.]

	Kansas City.	Sioux City.	Fort Benton.
Standard low water	722.44	1,082.74	2,203.59
Standard high water	736.96	1,093.16	2,210.59
Standard variation	14.52	10.42	7.00

Head of navigation, Fort Benton; by steamboats, 2,285 miles above mouth of Missouri River and 1,893 miles above Kansas City.

Amount of freight carried on the Missouri River from mouth to Sioux City, Iowa.

Calendar year—	Short tons.
1897	391,029
1898	319,793
1899	263,114
1900	277,306
1901	569,666
1902	410,527
1903	750,291
1904	455,000
1905	343,435
1906	573,348
1907	843,863
1908	541,144
1909	340,810
1910	876,130
1911	359,721

Amount of freight carried on the Missouri River above Sioux City, Iowa.

Calendar year—	Short tons.
1887	13,961
1888	12,895
1889	16,723
1890	14,072
1891	14,211
1892	17,292
1893	19,481
1894	37,936
1895	21,264
1896	10,368
1897	17,105
1898	26,896
1899	23,041
1900	27,179
1901	37,340
1902	31,070
1903	37,994
1904	28,951
1905	52,956
1906	43,987
1907	45,123
1908	17,517
1909	41,203
1910	25,037
1911	11,290

The bulk of this commerce occurs in the vicinity of Bismarck, Washburn, and Williston, N. Dak., extending upstream to mouth of Yellowstone, and downstream to Le Beau. The Benton Packet Co. handled about 4,460 tons of grain and other merchandise, with 8 boats, all except one being gasoline. These boats are light draft, stern wheel, gasoline, single cylinder, and carry cargo both aboard and by barge. There are elevators at Washburn, Deapolis, and Expansion, and at Williston. Otherwise landings are made directly on the banks.

North of Le Beau.

Amount (estimated) required to be appropriated for completion of existing project	Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance from Sioux City to Fort Benton	$150,000

South of Le Beau.

Amount (estimated) required to be appropriated for completion of existing project	Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance from Kansas City to Sioux City	150,000

Kansas City to Fort Benton—Consolidated.

Amount (estimated) required to be appropriated for completion of existing project		Indefinite.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance:		
Kansas City to Sioux City	$150,000	
Sioux City to Fort Benton	150,000	
		300,000

Following is the report of the Board of Engineers on a recent survey of the river from Sioux City to Fort Benton, printed in House Document No. 91, Sixty-second Congress, first session:

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, February 27, 1911

Respectfully returned to the Chief of Engineers, United States Army.

This is a report on survey of the Missouri River from Sioux City, Iowa, to Fort Benton, Mont. Owing to the physical characteristics of the stream, the district officer divides this section of the river into two reaches, the rocky portion extending from Fort Benton to Carroll, a distance of 172 miles, and the sandy portion from Carroll to Sioux City, a distance of 1,302 miles, making a total of 1,474 miles. As stated in report of preliminary examination, there is no regularly adopted project for the improvement of this portion of the Missouri River. On the sandy reach, work has been carried on as appropriations were made from time to time by snagging and occasional dike and revetment work in the vicinity of the larger cities, and some dredging, dike, and other construction work has been done on the rocky portion. There has been expended in all to June 30, 1910, about $2,281,500, of which amount about $475,000 was for snagging. The district officer describes in detail the various works that have been constructed throughout, giving the cost thereof. Construction work began in 1876 and has continued at irregular intervals since.

The district officer presents several plans of improvement at widely varying costs. He deems it practicable to secure a 3-foot navigable depth in the rocky reach at an ultimate cost of $300.000 to $500,000. He recommends, however, that work on this section be limited to an original outlay of $10,000 for plant and a regular annual expenditure of $7,500 for its operation. He estimates that on the sandy reach a 4-foot channel can be secured from Carroll to Williston, 392 miles, and a 6-foot channel from Williston to Sioux City, 910 miles, by a systematic and continuous improvement at a cost of about $60,000 per mile, or $78,000,000 for the reach.

Deeming the cost of such an improvement excessive, the district officer considers a plan for systematic improvement in the vicinity of the towns to which the present commerce is tributary. In connection with this plan he submits maps of the reaches in the vicinity of Williston, Bismarck, Pierre, Fort Pierre, Yankton, and Sioux City, the estimates being $637,000, $533,000, $220,000, $800,000, and $750,000, respectively, a total of $2,940,000. He believes that even the complete systematic improvement of these separate localities is not warranted by present and prospective commerce. For the present he believes that the river should be improved by snagging throughout, rock removal and some dike work in the rocky portion, and urgent revetment and dike work in the sandy portion near important towns and landings, especially where through navigation is impeded or endangered. To this extent he believes the river worthy of improvement at the following estimated costs: Floating plant for the rocky portion, $10,000; annual appropriation for this reach, $7,500; for annual snagging and repairs to snag boats, $60,000; for repairs and extensions to existing works and urgent new works, $72,500, a total of $150,000 for the first year and $140,000 annually thereafter. The division engineer concurs generally in the views of the district officer.

An examination of the records shows that during the past 8 or 10 years the commerce on this reach of the Missouri River has averaged about 40,000 tons. There is practically no through commerce, it all being centered at a few localities from which boats ply for some distance up and down the river. There are no large manufacturing, commercial, or mining industries to be affected by the improvement, and there is no reason to anticipate a very large tonnage in the near future. No very great benefit to navigation could be expected except from a continuous systematic improvement, obviously not justified, as no lesser improvement would affect the through navigable depth. With a moderate amount of snagging and small expenditures where urgently needed at important localities where valuable landings are jeopardized or injurious cut-offs threatened, practical navigation can be maintained about as effectively as by any other method short of systematic improvement.

The board has carefully considered the question of the extent of justifiable improvement. If the amount of existing commerce be taken as a measure of the benefits from expenditures already made, the results can not be considered as encouraging, and the board does not believe resulting benefits would warrant as great an expenditure as the district officer recommends. Some work, however, appears justifiable. A large section of the country tributary to this reach of the Missouri River is not accessible to rail transportation and advantage must be taken of the river. While the commerce is not large, there are a number of boats constantly engaged and the continuous use of these boats indicates the necessity for water transportation. A moderate expenditure for the benefit of existing commerce and for the encouragement of prospective commerce is deemed necessary and advisable

In response to inquiry, the district officer has furnished information concerning the cost of work done during the last three years, as follows:

	1908	1909	1910
Snagging	$16,000	$17,000	$15,000
Repairs, extensions, and new works of improvement	37,340	24,595	57,275
Total	53,340	41,595	72,275

It appears that with these expenditures the channel has been kept reasonably clear of snags, and considerable new work has been accomplished.

In view of the facts presented, the board recommends that for the next few years an annual appropriation of $75,000 be made for the improvement of this reach of the Missouri River, to be expended in such manner as may be deemed most advisable by the Chief of Engineers, and that the question of further improvement or of continuing the appropriations be then determined in the light of the commerce developed.

The district officer describes fully existing wharves and landings, and the board reports, in compliance with law, that there are no questions of water power or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

Wm. T. Rossell,
Colonel, Corps of Engineers,
Senior Member of the Board.

GASCONADE RIVER, MO.

This river rises in the southern part of Missouri and flows generally northeast, emptying into the Missouri River at Gasconade, about 32 miles below the mouth of the Osage River. Total length with tributaries, about 200 miles; area of watershed, 3,478 square miles; low-water discharge, 450 second-feet; extreme flood discharge, 40,000 second-feet.

Length of river, mouth to Arlington, 107 miles. Improvement in recent years has extended to Gascondy, 62 miles above the mouth. The river is navigable to Arlington, and for tie and log rafting a considerable distance above.

The elevation of standard low water at the mouth is 80.11 feet, and of standard high water is 93.64 feet above St. Louis directrix, a range of 13.54 feet. The average slope of the river from Gascondy to the mouth is 1.23 feet per mile. Low water at Gascondy is approximately 156 feet above St. Louis directrix. The range between extreme low and high water averages about 20 feet.

This river is similar to the Osage. The original condition was one of alternate pools and shoals, with snags and overhanging trees.

The project for the improvement of this stream, adopted in 1880, consisted in the removal of snags and logs from the channel and of leaning timber from the banks of the river, where necessary, and the construction of wing dams and training walls to concentrate the flow of water upon the shoals to increase the depth over them.

The project or plan is general in its nature. The first appropriation was made in 1880, and no estimate of cost or time limit was given. The project contemplates maintenance and relief from year to year and the removal of obstructions, which are constantly forming anew. The improvement must therefore be considered continuous.

The river and harbor act of June 25, 1910, appropriated $20,000 for continuing improvement and for maintenance. It also provides for an examination and survey, Gascondy to Arlington. Report will shortly be submitted.

The river and harbor act of February 27, 1911, appropriated $10,000 for continuing improvement and for maintenance, and the river and harbor act of July 25, 1912, appropriated the sum of $10,000 for the same purpose.

An allotment of $5,500 from the emergency appropriation of June 25, 1910, was made for the repair of the dam at head of Pryors Bend.

The total of the appropriations and receipts from other sources for the improvement of Gasconade River, beginning with the act of June 14, 1880, is $162,124.31.

The amount expended to June 30, 1912, is $156,698.66.

The result of the expenditure has been to increase the depth over shoals, remove obstructions, and maintain navigation. The least depth at low water over shoals is 1½ to 2 feet, while in the pools the depths range from 4 to 15 feet.

The improvement has influenced freight rates by affording shippers a regular means of transportation by boat and in increasing the draft. There are practically no available rail facilities.

The work of improvement and maintenance is being carried out under the general plan followed since 1880, and based upon which the appropriation was made.

The improvement has influenced freight rates by affording shippers a regular means of transportation by boat and increasing the draft. There are practically no available rail facilities.

It is proposed to use the amount required for expenditure in fiscal year ending June 30, 1914, in addition to the balance unexpended July 1, 1912, for works of improvement in continuing present project, which is indefinite, including plant to carry on work and for maintenance of existing works.

In view of the funds in hand and survey report submitted to Congress in compliance with provisions of the river and harbor act of March 2, 1907, and not yet acted upon by Congress, the estimate submitted is for operating plant and maintenance.

Amount of freight carried on the Gasconade River.

Calendar year—	Short tons.	Calendar year—	Short tons.
1895	47,544	1904	14,791
1896	46,294	1905	29,837
1897	30,515	1906	27,604
1898	30,981	1907	50,083
1899	24,259	1908	28,887
1900	51,580	1909	29,931
1901	19,460	1910	30,758
1902	44,380	1911	41,535
1903	10,788		

Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance.......................... $10,000

OSAGE RIVER, MO.

The Osage River rises in the eastern part of Kansas and flows generally in an easterly direction, emptying into the Missouri River about 8 miles below Jefferson City, Mo.; total length about 500 miles.

Length of river, mouth to Warsaw, Mo., 172 miles. Above Warsaw the river was declared by act of March 4, 1904, to be not navigable. The river has been navigated to Osceola, 228 miles above the mouth, and has been used for rafts and logs at even greater distances. The river is now under improvement to the town of Linn Creek (Niangua River), 109 miles above the mouth. The elevation of standard low water at mouth, foot of Dodds Island, is 102.78, and of standard high water 116.36 above St. Louis directrix, a range of 13.58 feet. The average slope of the river from Osceola to the mouth is 0.74 foot per mile, and from Niangua River to the mouth about 0.60 foot per mile. The range between extreme low and high water averages 30 feet.

The original condition was one of alternate pools and shoals, with snags and overhanging trees.

The work has been carried on under two projects—that of open-channel improvement, by the construction of cross and wing dams, in addition to dredging and removal of obstructions to navigation, such as snags, etc., and the construction of a lock and dam 7 miles above the mouth of the river.

The first project or plan was general in its nature. The first appropriation was made in 1871, and no estimate of cost or time limit was adopted.

The removal of obstructions under this plan contemplates maintenance. The obstructions will form anew, and while the cross and wing dams have a degree of permanency, they must receive frequent repair and extension to keep up their efficiency.

The lock and dam was authorized by act of 1890, no time limit or total cost given. This work has been practically completed. The crest of the dam is about 13 feet above low water and creates a pool for about 18 miles.

The river and harbor act of June 25, 1910, appropriated $35,000, of which $10,000 was allotted for continuing improvement and for maintenance and $25,000 for completion of lock and dam.

The act of February 27, 1911, appropriated $15,000 for general river improvement and for maintenance, and the act of July 25, 1912, appropriated $15,000 for the same purpose.

The total of the appropriations and receipts from other sources for improvement of the Osage River, beginning with the act of March 3, 1871, is $1,021,030.03.

The amount expended by the General Government to June 30, 1912, on both projects is $979,040.49, of which $355,046.61 is for general improvement, and $623,892.48 is for lock and dam.

The result of the expenditure has been to increase the depth over the shoals, remove obstructions, and keep open navigation. The least depth at low water over shoals is 1½ to 2 feet, while in the pools the depth ranges from 5 to 15 feet.

The work of general improvement follows the general plan adopted in 1871, and based upon which the first appropriation was made.

The improvement has influenced freight rates by affording shippers a regular means of transportation by boat and increasing the draft. Practically no rail facilities.

It is proposed to use the amount required for expenditure in fiscal year ending June 30, 1914, in addition to the balance unexpended July 1, 1912, for works of improvement, and for maintenance of general improvement, including snagging, dredging, and repairs to dikes and open-river work.

In view of the funds in hand and survey report submitted to Congress in compliance with a provision of the river and harbor act of March 2, 1907, and not yet acted upon by Congress, the estimate submitted is for operating plant and maintenance.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	$15,000

HUMBOLDT HARBOR AND BAY, CAL.

Before improvement the entrance to the harbor was obstructed by a bar having channel depths of 12 to 15 feet. This channel was not fixed in direction and was not straight. The channel had a width of about 600 feet generally. The plane of reference is mean lower low water. Navigation with the deeper draft vessels was generally limited to higher stages of the tides and to favorable conditions of the wind and weather. This locality is about 272 miles north of San Francisco.

(*a*) *Rebuilding jetties.*—A project for the improvement of the harbor entrance was made in 1882, and provided for a single low south jetty 6,000 feet in length; this was modified in 1888 and again in 1891, so as to provide for parallel high jetties, each about 8,000 feet in length. The amount expended on original and modified projects, including the channel in front of Eureka, prior to operations under existing project, was $2,178,704.14.

The present project provides for rebuilding the jetties in accordance with the report submitted in House Document No. 950, Sixtieth Congress, first session, at an estimated cost of $1,037,400. The document referred to does not contain a map. This project was adopted June 25, 1910.

The existing project has not been modified since its adoption.

During the year a stone receiving and handling plant was installed by hired labor at a cost of $94,275; a total of 27,597.86 tons of stone of three classes were delivered by contract, received and placed on the south jetty with the Government plant and by hired labor. This work was all rebuilding the old south jetty. A total of $164,449.67 was expended during the year.

A total of $170,895.20 was expended on the existing project up to June 30, 1912, and this was all for new work under the present project. The sum of $6 has been received from the sale of unserviceable articles, $44.48 has been received by way of reimbursement from the Isthmian Canal Commission, and $5.58 by way of reimbursement from the Department of Commerce and Labor.

A total of $86,895.70 had been expended on the existing project up to June 30, 1912. Nothing has been spent for maintenance and nothing received from sales or other sources.

The approved project was completed in 1908. The maximum draft that can be carried June 30, 1912, over the shoalest part of the improved channel is 16 feet at mean lower low water. The length of the improved channel is 6,200 feet in length. The head of navigation is the town of Eureka. The tidal range is 6 feet.

The commerce of this locality is part of the commerce reported in connection with the work of rebuilding the jetties at the entrance to Humboldt Bay, and can not be segregated.

By making commerce for deep-draft vessels possible this project has doubtless tended to reduce freight rates, but there are no statistics available for a comparative analysis.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be used for maintenance.

Amount (estimated) required to be appropriated for completion of existing project	$467,400
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	300,000

(*b*) *Channel in front of Eureka.*—In its original condition the ship channel in front of Eureka had a least depth of 10 feet at mean lower low water, the plane of reference. This channel is in Humboldt Bay, which has a length of 10½ miles and an average width of three-fourths of a mile. The Eureka channel is about 5 miles from the jetty channel at the entrance to Humboldt Bay. Originally navigation was limited to the higher stages of the tide.

The original project was adopted in 1881, and provided for a channel 200 feet wide and 12 feet deep. This was modified in 1899 to provide a channel of the same width 8,900 feet long and 15 feet deep. The total amount expended on original and modified projects prior to operations under present project is included in the amount spent on the jetties and can not be separated from it.

The existing project provides for a channel 300 feet wide, 18 feet deep, and 6,200 feet long. The estimate of cost was $83,000, and the project was adopted by Congress on March 2, 1907. This project is based on survey report printed in House Document No. 228, Fifty-ninth Congress, first session, which contains a map.

This work is in progress under the continuing-contract appropriations, and the balance of the authorization remaining to be appropriated is $467,400.

The approved project was 16.30 per cent completed on June 30, 1912, but the work of rebuilding the jetties has not progressed sufficiently yet to have any great effect on the entrance channel. The maximum draft that can be carried June 30, 1912, over the shoalest part of the channel is 21 feet at mean lower low water. The tidal range is about 6 feet. The length of the jetty channel is 1⅝ miles, and the head of navigation is principally at Eureka, although considerable lumber shipments originate at Arcata and Samoa.

The commerce for 1911 was about 641,457 short tons of exports, valued at $9,609,760, and 129,103 short tons of imports, valued at $5,799,100.

The improvement has doubtless had a tendency to maintain reasonable freight rates, but there is no connection by rail with other ports, and therefore no competition with railroads.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to rebuilding the jetties, and is necessary for the purpose of extension of benefits.

Since the date of preparation of the estimates for 1914 report has been received from the local officer that on account of increase in the cost of rock and greater quantities required than contemplated at the time the original estimate was submitted it now appears that the continuing-contract authorization made by the act of 1911 will not be sufficient to complete the project. In order that the work may be prosecuted economically and advantageously an additional amount of

$150,000 should be made immediately available and the appropriation of this sum in the next river and harbor act is recommended.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$20,000

Consolidated.

Amount of continuing-contract authorization, act of Feb. 27, 1911	$717,400
Amount appropriated under such authorization	250,000
Amount yet to be appropriated	467,400
Amount (estimated) required to be appropriated for completion of existing project	467,400
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	300,000
For maintenance of improvement	20,000
Total	320,000

LOS ANGELES HARBOR, CAL.

Los Angeles Harbor is 393 nautical miles southerly of San Francisco and 89 nautical miles northerly of San Diego Harbor. It consists of two parts: (*a*) The outer or breakwater harbor, formerly designated San Pedro Harbor, and (*b*) the inner harbor, formerly designated Wilmington Harbor. On account of the consolidation of the cities of San Pedro and Wilmington with Los Angeles on August 12, 1909, later appropriations for these works were made under the name of Los Angeles Harbor.

(*a*) *The outer harbor.*—Originally San Pedro Bay was an open roadstead, with a considerable amount of kelp, well protected on the west by the bluff which terminates at Point Fermin, but exposed to the southeast, south, and southwest.

The river and harbor act of June 3, 1896, authorized the appointment of a board to select the location of a breakwater at Santa Monica Bay, or San Pedro Bay, Cal., and to make plans, specifications, and estimates therefor. The Secretary of War was authorized to make contracts for the completion of the work in accordance with the project of the board at a cost not exceeding $2,900,000. The board submitted its report March 1, 1897, in favor of San Pedro Bay. This report is printed (with maps and drawings) in Senate Document No. 18, Fifty-fifth Congress, first session.

The project of the board contemplated a breakwater to the eastward of Point Fermin about 8,500 feet in length, or as much longer as could be constructed within the authorized limit of cost, $2,900,000. The project was adopted by Congress in the river and harbor act of June 3, 1896.

The amount expended under the project is $2,830,400.85, including $35,555.76 expended by the board.

The breakwater as built is of somewhat stronger cross section than as planned by the board. It consists of two straight arms connected by a curve 1,800 feet in length, of 1,910 feet radius. The westerly arm is 3,000 feet long, pointing S. 72° E. (magnetic); the easterly arm, as extended, 4,450 feet long, pointing N. 54° E. (magnetic). A gap of about 1,850 feet was left between the east shore of Point Fermin and the westerly end of the breakwater. The construction of the breakwater has resulted in the dying out of the kelp, and there is now afforded a harbor of refuge, easy of access and secure from storms, for vessels of the largest size. It shelters 370 acres with 30 to 50 feet depth at mean lower low water, and 200 acres additional (outside established harbor lines) with 20 to 30 feet depth at mean lower low water. Two channels 30 feet deep have been dredged by private enterprise, each about 5,500 feet long, alongside wharves constructed or under construction. The breakwater also shelters the entrance to the inner harbor.

Of the $2,900,000 appropriated as the authorized cost of the project there remains an available balance of $69,599.15. Pursuant to authority in department indorsement of August 12, 1910, about $55,000 of this amount, together with the $178,000 appropriated by Congress June 25, 1910, was made available for extending the breakwater to the shore.

The existing *breakwater* project (for *dredging* project, see next paragraph) is to extend the breakwater to the shore and is printed (without map) in House Document No. 969, Sixtieth Congress, first session, and was authorized by Congress in river and harbor act of June 25, 1910, which appropriated $178,000 for the work. No modification has been made in this project. The breakwater extension is to be built of random rubble stone to a height of 15 feet above mean lower low water, with a top width of 15 feet and slopes of 1 vertical to 1½ horizontal on the ocean side and 1 vertical to 1⅓ horizontal on the harbor side. Its length is 1,887 feet, and it is estimated to contain 142,400 long tons of stone. The amount expended on this project up to June 30, 1912, is $166,745.92. A contract for doing this work at $1.38 per long ton of stone was entered into January 4, 1911. During the fiscal year ending June 30, 1912, 114,207 long tons of stone was placed, making a total under the contract of 129,362 tons. The work is completed to full height for about 1,667 linear feet and is to low water for about 220 feet additional. The project is about 91 per cent completed. The result of the work done is to quiet the water of the anchorage area and alongside the wharves of the outer harbor.

The river and harbor act of June 25, 1912, adopted a project for dredging to the depth of 35 feet an area in the outer harbor, lying between the 35-foot contour in the bay and the pierhead line at the outer end of the property of the Outer Harbor Dock & Wharf Co., and at the outer end of that part of the city's property which lies just west of the inner harbor entrance, and appropriated $327,250 for carrying out this project. This project is printed (without map) in River and Harbor Committee Document No. 8, Sixty-second Congress, second session.

The Outer Harbor Dock & Wharf Co. is reclaiming about 156 acres in the outer harbor and constructing wharves, warehouses, etc. It has constructed around this area 11,850 linear feet of bulkhead, has deposited behind these bulkheads 1,984,630 cubic yards of material dredged from the east and west channels, and has constructed 5,295 feet of wharf frontage. The east channel has been dredged to a depth of 30 feet at mean lower low water and 266 feet wide for its full length out to the 30-foot contour. The west channel has been dredged to 30-foot depth and 400 feet wide out to the 22-foot contour. The northerly 1,200 feet of this channel has been widened to 600 feet.

The Pacific Wharf & Storage Co. has inclosed within a stone bulkhead east of the east jetty and north of Deadmans Island an area of about 80 acres, a portion of which has been reclaimed. The have also dredged a slip 30 feet deep, 250 feet wide, and 1,735 feet long in this area, and have constructed a wharf 1,402 feet long along the westerly side of the slip. The San Pedro, Los Angeles & Salt Lake Railroad Co. has also bulkheaded and reclaimed with material deposited by the Government dredge about 81 acres of land north of the area under improvement by the Pacific Wharf & Storage Co.

The city of Los Angeles has begun the improvement of 79 acres on the westerly side of the entrance channel.

(*b*) *The inner harbor.*—Previous to the commencement of improvement, in 1871, there was a depth of less than 2 feet of water at low tide at the present entrance, the sea breaking across what is now Terminal Island at various points. Vessels anchored in the outer harbor, and cargoes and passengers were transferred by lighters to Wilmington. Wilmington Lagoon was a large expanse of shallow water, containing but one good channel, namely, the channel leading to Wilmington.

Outside pierhead lines the inner harbor now contains 770 acres, of which 113 acres have been dredged by the United States to 30 feet and 46 acres to 25 feet. In addition a channel 9,000 feet long, 20 feet deep, and 200 feet wide has been dredged by the United States in the east basin; the city of Los Angeles has done certain dredging in Mormon Island Channel and Wilmington Basin, and a channel about 3,300 feet long has been dredged by private enterprise from the east basin to the property of the Consolidated Lumber Co.

The existing projects (without maps) for the improvement of the inner harbor are printed in House Document No. 1114, Sixtieth Congress, second session, and House Document No. 768, Sixty-first Congress, second session, and were adopted by the river and harbor act approved June 25, 1910. They provide for—

First, dredging to 30-foot depth at mean lower low water from the entrance up to and including the turning basin. It was estimated that this work would require the dredging of 3,000,000 cubic yards of material at a cost of 14 cents per yard, or $420,000. On June 30, 1911, the increase of this estimated cost to $596,000 was authorized for the following reasons: The original estimate for this work contemplated doing all the dredging by suction with the U. S. dredge *San Pedro*. The character of the material in the outer 5,600 feet of the channel, and especially opposite Deadmans Island, was such that it was found necessary to handle the same by clamshell or dipper dredge. A total of $495,000 has been appropriated for this work by the river and harbor acts of June 25, 1910, February 27, 1911, and July 25, 1912.

Second, dredging two channels from the turning basin into the east and west basins, respectively, the channels to be 200 feet wide and 20 feet deep. It was estimated that this work would require the removal of 2,200,000 cubic yards of material at an estimated cost of $390,000, including the construction of a dredge, subsequently reduced to $220,000.

No modifications have been made in these projects.

The amount expended on these projects to June 30, 1912, is $497,657.18. Receipts from the sale of condemned property during the year amounted to $41.50.

The result of the work done by the United States is to make 16,000 linear feet of wharf frontage accessible to vessels drawing down to 30 feet, and to increase the draft that can be carried to the upper parts of the inner harbor.

For the calendar year 1911 the commerce of this port amounted to 1,720,711 short tons. It consisted principally of lumber, crude oil, and general merchandise received, and of general merchandise and crude oil shipped. Its value is estimated at $77,704,843.

It is difficult to estimate the effect of these improvements on freight rates, since into that matter so many factors enter besides depth of water. Lumber is the largest item of commerce at this port. The rate on lumber from Puget Sound and Oregon-Washington ports to this harbor is about the same to-day as it was 10 years ago. The most perceptible effect of the improvement is in the volume of commerce, which has increased 300 per cent in the last 10 years.

There are three regular lines of coasting freighters that touch at this harbor and make the ports of Panama and Salina Cruz. Since the reduction in the rail rate San Pedros-Los Angeles below the rate San Diego-Los Angeles, the American-Hawaiian Line has arranged to touch at San Pedro. Vessels of the Harrison and Kosmos Lines land regularly at the wharf of the Outer Harbor Dock & Wharf Co., and recently 9,000 tons of grain, raised in the Imperial Valley (on the Mexico side), has been shipped in bond to Liverpool from this same wharf.

The full effect of the work done by the United States in the improvement of this harbor will not be realized until after the opening of the Panama Canal. The all-rail rate from the Atlantic coast to Los Angeles is from 20 to 30 per cent higher than the "water" rate, the latter being the rate via Tehuantepec or Panama. The volume of commerce via Tehuantepec and Panama, moreover, is restricted by the limited capacity of the transisthmian railroads. The all-rail rate on citrus fruits Los Angeles to Atlantic coast points is $23 a ton. It is estimated that after the opening of the canal citrus fruits can be profitably taken from Los Angeles to New York, Philadelphia, or Boston for $11 a ton. The rate for about the same distance from Mediterranean ports to New York is $7 a ton. The citrus crop raised within 100 miles of San Pedro amounts to about 75,000 carloads (14 tons per car).

The funds asked for herein for the fiscal year ending June 30, 1914, will be used in completing the 30-foot and 20-foot projects.

Dredging in inner harbor to 30 feet.

Amount (estimated) required to be appropriated for completion of existing project	$101,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	101,000

Dredging two channels from turning basin to east and west basins of inner harbor.

Amount (estimated) required to be appropriated for completion of existing project	$20,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	20,000

Consolidated.

Amount (estimated) required to be appropriated for completion of existing project	$121,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	121,000

OAKLAND HARBOR, CAL.

Oakland Harbor in its original condition was a tidal estuary connecting San Francisco Bay with a tidal basin. There was an available channel 500 feet wide and 2 feet deep, and commerce was possible only at higher stages of the tide. The plane of reference is mean lower low water. The length of the estuary to the tidal basin is 4¾ miles, and the channel around the tidal basin is about 2⅜ miles long. The channel through the tidal canal is about 2¼ miles long. This locality is adjacent to the harbor of San Francisco and lying to the east thereof.

The original project was submitted in 1874 and provided for two training walls at the entrance, a canal connecting the tidal basin with San Leandro Bay, a dam in San Leandro Bay, and dredging the tidal basin and deepening the channel through the estuary to San Francisco Bay. This project was modified in 1902 and again in 1907.

The amount spent on original and modified projects prior to operations under existing project was $3,420,965.54.

The river and harbor act of June 25, 1910, provided for either continuing work under the above project or, in the discretion of the Secretary of War, improving in accordance with plan of improvement printed in House Document No. 647, Sixty-first Congress, second session. On July 25, 1910, the Secretary of War designated the latter project as the one that should be adopted. This project provides for a channel 500 feet wide and 30 feet deep from the bay to the tidal basin, 300 feet wide and 25 feet deep around the tidal basin, and 18 feet deep in the tidal canal, at an estimated cost of $1,100,000, and $25,000 annually for maintenance.

The total expenditures on existing project to June 30, 1912, were $197,670.93. It is impossible to segregate the amount spent for maintenance from the total expenditures, because maintenance work is done simultaneously with deepening the channel, which is new work.

The approved project was 17.5 per cent completed June 30, 1912. The results accomplished to date are a completed channel 30 feet deep extending westerly from the Webster Street drawbridge for a distance of 11,800 feet and varying in width from 300 to 500 feet. The maximum draft that can be carried June 30, 1912, is 23 feet from the entrance of the jetty channel for a distance of 4,500 feet; thence to Webster Street 30 feet; thence to the tidal basin 23 feet; thence around north channel of tidal basin 11 feet; and around south channel of tidal basin 13 feet; and through the tidal canal 10 feet.

The length of the improved channel from San Francisco Bay to the tidal basin is about 4¾ miles, and the length of the channel around the tidal basin is about 2⅜ miles. The length of the channel in the tidal canal is about 2¼ miles.

The total exports and imports by vessels and ferries for the calendar year 1911 was 3,796,683 short tons, valued at $154,224,950. This commerce consists of lumber, building materials, farm products, crude oil, fuel, and general merchandise.

It is difficult to estimate what increase of commerce is likely to result from an increased depth and width of channel in Oakland Harbor. At present about 64 per cent of the total tonnage of Oakland Harbor is overland freight transferred across the bay on ferryboats, which, when loaded with cars, draw only about 8 feet of water. If improvement be continued it will permit the deeper-draft vessels to carry to and from Oakland merchandise which now is transported over the ferries. It also should induce an increase in manufacturing industries on the shores of this harbor.

It is believed that the improvement has had no material effect on freight rates.

The funds remaining available on June 30, 1913, and the additional appropriation asked for, will be expended during the fiscal year 1914 in continuing the improvement, or in the purchase of a dredge if bids received are not reasonable. This will be for extension of benefits and for removing shoals that have developed in the channel since it was previously dredged.

Amount (estimated) required to be appropriated for completion of existing project	$575,481.65
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	275,000.00

SAN DIEGO HARBOR, CAL.

San Diego Harbor is just north of the United States-Mexico boundary, 89 nautical miles southerly of Los Angeles Harbor, and 482 nautical miles southerly of San Francisco. At 21-foot depth of water at mean lower low water it has a width varying from 500 feet to 2,000 feet, and is about 9 miles long. The total water area is about 21 square miles at half tide.

At the time of the adoption of the original project the governing depth on the bar at mean lower low water was 21 feet, with a width of channel of 500 feet. Just inside the entrance was a middle ground, with a channel through it carrying about the same depth as the channel through the outer bar. The main channel, lying to the west of the middle ground, was of ample depth, but was difficult of navigation on account of two sharp turns.

The river and harbor act approved March 3, 1875, appropriated $80,000 for the construction of a dike across the mouth of San Diego River to make it empty into False Bay and thus prevent injury to San Diego Harbor from deposit of material brought down during floods. This work was completed in 1876 at a cost of $79,798.72. The cost of repairs made since has brought the total of expenditures to $86,832.03. Further repairs to the dike have been made by the city of San Diego.

The project for the improvement of the harbor, adopted by the river and harbor act approved September 19, 1890, provided for the construction of a jetty on Zuninga Shoal at the entrance to the harbor, the maintenance of a channel 24 feet deep at mean low tide and 500 feet wide through the middle ground, and repairs to the restraining dike. The jetty was to rise to the height of extreme high water and to be about 7,500 feet long, with a view to producing a depth of 26 feet at mean lower low water on the outer bar.

The original estimated cost of this improvement was $394,400. This estimate was increased in June, 1900, to $542,850. With this amount the jetty was extended to its full contemplated length of 7,500 feet, a channel 26 feet deep and 271 feet wide (28 feet deep over a width of 171 feet) was dredged across the outer bar, and a channel 26 feet deep and 400 feet wide was dredged across the middle ground. Later the channels through the outer bar and the middle ground both shoaled to 24 feet deep. The amount expended on this harbor up to the completion of this project was $625,211.68.

The existing project is contained (with map) in House Document No. 961, Sixtieth Congress, first session, and was adopted by Congress in the river and harbor act of June 25, 1910. One hundred and twenty-five thousand dollars was appropriated by that act for carrying out the project, which contemplated dredging a channel through the outer bar 30 feet deep and 600 feet wide, with side slopes of 1 on 5, and also a channel through the middle ground to a depth of 30 feet; this latter channel to be 400 feet wide at its southerly end and to widen out at the northerly end in order better to accommodate vessels using the United States Navy coaling station at La Playa. No modification has since been made in this project. On October 24, 1910, a contract was entered into for doing this dredging at $0.1489 per cubic yard, work to begin May 1, 1911. Work began May 31, 1911. During the fiscal year ending June 30, 1912, 370,093 cubic yards was removed from the bar channel, and 330,455 yards from the middle-ground channel. Amount expended during the fiscal year under the project (new work) was $123,742.29.

The dredging contract was completed May 3, 1912, a total of 411,027 cubic yards having been removed from the outer bar channel, and 378,114 yards from the middle-ground channel, or 789,141 yards in all. This material was dumped at sea. A channel 600 feet wide and 30 feet deep (32 feet deep over a width of 300 feet) was dredged through the outer bar, and a channel 30 feet deep and of a width increasing from 700 feet at the south end to 1,000 feet at the north end was dredged through the middle ground. This completed the project.

Up to the close of the fiscal year (June 30, 1912) a total of $124,703.68 was expended on the project, all for new work.

The maximum draft that could be carried into the harbor at mean lower low water on June 30, 1912, was 30 feet. The average height of all high waters above the plane of reference is 4.8 feet. The average of the higher high tides is 5.5 feet.

On February 5, 1912, the harbor lines approved June 21, 1892, were modified by the Secretary of War.

The commerce of this harbor was 395,634 short tons for the calendar year 1911. It consisted principally of lumber, crude oil, coal, manufactured iron and steel, and general merchandise. Its value is estimated at $41,164,243.

The largest vessels using this harbor are the 8,000 to 12,000 ton vessels of the American-Hawaiian Line, which maintains a weekly service to Salina Cruz, San Diego, San Francisco, etc. The completion of work under the last project will permit these vessels to enter at any stage of the tide, while heretofore, from time to time, they had to wait for a stage above the low. No new lines of water transportation have been established during the year. A railroad (the San Diego and Arizona) is under construction between San

Diego and Yuma. It will make San Diego a distributing and concentrating point for the Imperial Valley. The freight rate from Atlantic coast points to San Diego, via Tehauntepec or Panama, is from 20 to 30 per cent less than the all-rail rate. The city of San Diego is just entering upon the construction, at a cost of about $1,000,000, of a harbor terminal, the use of which will reduce the cost of loading and unloading vessels at this port. Making due allowance for the difference in the wages paid native and foreign crews, delay in passing through the canal, etc., the completion of the Panama Canal should effect a considerable reduction in rail and water rates to and from San Diego.

There has not been time since the completion of the last United States project for any effect to be produced upon the volume of commerce at this point. The full effect of this work and of the municipal improvements just beginning will not manifest itself until after the opening of the Panama Canal.

The additional funds asked for to be expended during the fiscal year ending June 30, 1914, are for maintenance, and will be applied toward maintaining the project depth, 30 feet, in the channels through the outer bar and middle ground.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$35,000

SAN PABLO BAY, CAL.

San Pablo Bay is 12 miles long by 6 miles wide and is about 10 miles northeast of San Francisco Harbor. Before improvement there was a shoal with a least depth of 19 feet at mean lower low water lying across the path of vessels going to and from the Sacramento and San Joaquin Rivers and Mare Island Navy Yard. For the deeper-draft vessels navigation was possible only at the highest stages of the tide. The plane of reference is mean lower low water.

The original project was adopted June 13, 1902, and provided for a channel 300 feet wide, 30 feet deep, and 27,000 feet long across the shoal in the bay.

A total of $335,165.33 was spent on original project prior to operations under present project.

The existing project, adopted February 27, 1911, provides for dredging the channel in San Pablo Bay to a width of 500 feet and depth of 30 feet, and for a dredge for maintenance. The project is based on report contained in House Document No. 1103, Sixtieth Congress, second session, which contains maps. The total estimated cost of the War Department part of the project is $760,000, with $100,000 annually for maintenance. There has been no modification in the existing project since its adoption.

A dredging plant has been constantly engaged under contract dredging out the channel since October, 1911. A total of 561,195 cubic yards of material was excavated and properly deposited, and the total expenditure during the fiscal year was $82,223.09.

The total amount expended on the existing project to June 30, 1912, was $82,234.65, no part of which was for maintenance of present project, and nothing has been received from sales or other sources.

The work of dredging is being done under continuing contract appropriations, and the amount remaining to be appropriated is $238,000.

The work in progress consists of dredging a channel through Pinole Shoal over a length of 27,000 feet. The approved project was 16.65 per cent completed on June 30, 1912.

The result accomplished is a channel 500 feet wide and 30 feet deep throughout the first section of 5,000 feet, beginning at a point 7,300 feet north of Pinole Point, and in addition a channel 305 feet wide and 30 feet deep throughout the second section of 5,000 feet. The available depth in the first and second sections is 30 feet, and 24-foot depths in the other three sections. The ordinary range of tides is from 3.5 to 6.5 feet.

Improvement is needed to permit naval vessels to reach Mare Island Navy Yard at all stages of the tide. It is not required by the present commerce, and has had no effect on freight rates.

The funds estimated for expenditure in the fiscal year ending June 30, 1914, will be used to complete dredging under contract and for maintenance work with Government plant. This will be partly new work and partly renewal of old work.

Amount of continuing contract authorization, act of Feb. 27, 1911	$360,000
Amount appropriated under such authorization	122,000
Amount yet to be appropriated	238,000
Amount (estimated) required to be appropriated for completion of existing project	238,000
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	238,000
For maintenance of improvement	40,000
Total	278,000

MOKELUMNE RIVER, CAL.

This stream rises in the Sierras in eastern California, flows westward across central California, and empties into the San Joaquin River 20 miles above the junction of the Sacramento and San Joaquin Rivers at the upper end of Suisun Bay. In its upper portions the Mokelumne is a mountain stream, more or less torrential. In the lower part of its course it enters the delta of the San Joaquin and Sacramento Rivers, connects with other navigable sloughs, and is subject to tidal influence. This circumstance makes the lower portions of the stream navigable. Tidal influence extends up to a point about 2 miles above the Galt-New Hope Bridge.

In 1881 an estimate, amounting to $8,250, was submitted for removing snags, overhanging trees, etc. The first appropriation for improvement, $8,500 in amount, was made by the act of Congress of July 5, 1884. Since that time small appropriations have been made from time to time, and they have been applied toward obtaining and maintaining low-water steamboat channels by removing snags, overhanging trees, and occasional dredging.

A low-water depth of 9 feet is maintained except in the stretch of 8 miles between New Hope Landing and Galt-New Hope Bridge where the depth is 3 feet.

The total amount expended on the project up to the close of the fiscal year ending June 30, 1912, was $28,959.65, principally for maintenance.

Approximately 35,000 short tons of freight is carried on the stream annually, valued at $2,500,000. The river is crossed by three railroads a few miles above the head of navigation, and the maintenance of navigation on the stream has a decidedly beneficial influence upon the freight rates by rail.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, is needed to maintain the existing steamboat channel depths in both forks of the river from its mouth up to the Galt-New Hope Bridge, by dredging occasional shoals, removing snags and overhanging trees.

Amount (estimated) required to be appropriated for completion of existing project	Indeterminate.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$1,000

PETALUMA CREEK AND NAPA RIVER, CAL.

(*a*) *Petaluma Creek*.—Before improvement this creek was very crooked, dry in many places at low tide, and could be navigated only at the higher stages of the tide. The channel was from 80 to 600 feet wide. The plane of reference is mean lower low water.

The original project was adapted in 1880 and provided for cut-offs and dredging to obtain a channel 50 feet wide and 3 feet deep. In 1892 this was modified so as to provide a channel as deep as funds would permit. The amount expended on original and modified projects prior to operations under present project was $67,808.52.

The existing project, adopted by Congress March 2, 1907, provides for dredging a channel 6 feet deep and 50 feet wide from the mouth to McNears Canal, and 4 feet deep and 50 feet wide thence to the head of navigation. The estimate of cost was $15,239. The project is based on report contained in House Document No. 387, Fifty-ninth Congress, first session, which contains a map.

The existing project has not been modified since its adoption.

Work was begun in May, 1912, dredging a channel across the flats in San Pablo Bay, at the mouth of Petaluma Creek. This work was completed June 3, 1912, and was done under contract. A total of 247,340 cubic yards of material was thus excavated and the total expenditures for the year were $25,248.56, of which $15,354.40 was from the appropriation for emergencies in river and harbor works, act of March 3, 1909.

The total amount expended on the existing project up to June 30, 1912, was $56,784.88; of this amount $14,378.65 has been spent for maintenance.

The approved project was completed in 1907 and all work done since has been for maintenance of the authorized width and depths of channel. The maximum draft that can be carried June 30, 1912, over the shoalest part under improvement is 1 foot in the upper section and 4 feet in the lower sections at mean lower low water. The tidal range is about 8 feet and the improved portion is about 18 miles long, exclusive of the work in San Pablo Bay outside of the mouth of the creek. The head of navigation is the town of Petaluma.

The commerce of the creek for the year ending December 31, 1911, is given as 223,403 tons, valued at $12,338,340, and consists mainly of grain, mill stuffs, eggs, wines, liquors, and general merchandise.

It is considered that water transportation has aided largely in the development and prosperity of the contiguous country and has effected a material reduction in freight rates.

The amount estimated as a profitable expenditure in fiscal year 1914 will be applied to maintenance, and is necessary to make the present improvement available.

(*b*) *Napa River.*—Napa River has its source in the St. Helena Mountains, and it empties into Mare Island Strait, an arm of San Pablo Bay. Napa River has a length of about 45 miles and flows generally in a southeasterly direction. The section included in the project is the lower 18 miles of the river. Before improvement the river had a low-water depth of 5 feet for the first 12 miles above the mouth and about 1 foot depth to the crest of the bars in the next 6 miles to the head of navigation. The river was from 125 to 300 feet in width along the navigated section. Before improvement navigation was possible only at the higher stages of the tide.

A project for the improvement of this river was adopted in 1888, and provided for dredging and cutting off projecting points of land, so as to obtain a channel 75 feet wide and 4 feet deep, and to remove logs, snags, and other obstructions, at an estimated cost of $27,600. This project has not been modified since its adoption.

The total amount expended on this improvement to June 30, 1912, is $46,876.06. Of this amount $19,276.06 has been spent for maintenance of improvement.

The sum of $19.45 was received by way of reimbursement from the Isthmian Canal Commission and $25 from the Department of Commerce and Labor.

The full width and depth of the authorized channel is now generally available for vessels. The maximum draft that can be carried June 30, 1912, over the shoalest part under improvement is 3 feet at mean lower low water. The ordinary range of tides is about 5 feet; spring tides reach a height of 7 feet. The length of the improved section is 18 miles, and the head of navigation is the city of Napa.

The commerce of Napa River during the year 1911 amounted to 207,709 tons, valued at $9,753,505, and consists mainly of lumber, mill stuffs, building materials, wines, hides, live stock, and general merchandise.

The effect of the improvement has been to secure and maintain reasonable freight rates.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied to dredging, and is necessary to make the present improvement available and also for the purpose of extension of benefits.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement.. $18,000

REDWOOD CREEK, CAL.

Redwood Creek empties into San Francisco Bay about 25 miles touth of San Francisco. Before improvement there were shoals in shis creek which were bare at low tide, and vessels used it only during medium stages of the tide.

The channel was from 80 to 400 feet wide. The plane of reference is mean lower low water.

The original project was adopted in 1882 to dredge a channel about 6,000 feet long, 50 to 60 feet wide, and 2 to 3 feet deep. In 1902 this project was modified to provide for a channel depth of 5 feet and certain works to confine the current. The total amount spent prior to adoption of present project was $31,442.66.

The present project, adopted by Congress in the river and harbor act approved June 25, 1910, provides for a channel 150 feet wide and 5 feet deep at mean lower low water up to the city dock, about three-fourths of a mile below Redwood City. The estimated cost is $12,000, with $1,500 annually thereafter for maintenance.

The present project was entirely completed early in the fiscal year, and the result is a channel 150 feet wide and 5 feet deep from San Francisco Bay to the city dock. This channel is wider than is required by existing or prospective commerce, but it does not extend to the head of navigation. Private parties have dredged a channel 50 feet wide and 4 feet deep from the city dock to the head of navigation at Redwood City.

The maximum draft that can be carried June 30, 1912, over the shoalest part under the project is 5 feet at mean lower low water. The tidal range is about 8 feet. The project is wholly completed and the head of navigation is Redwood City.

The amount of commerce carried on Redwood Creek during the year ending December 31, 1911, is given as 51,495 short tons, valued at $860,810. This shows a decrease over the amount reported for the preceding year.

The effect of the improvement of this stream by the United States has been to secure the so-called railroad terminal rates for Redwood City, the railroad rates being as low as water rates.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, will be applied to dredging, and this work is necessary to make the present improvement available.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	**$3,000**

SACRAMENTO AND FEATHER RIVERS, CAL.

The Sacramento River has its source in the Sierras in northern California, and flows south through the Sacramento Valley until it joins the San Joaquin River near the head of Suisun Bay. The total length of the Sacramento is approximately 350 miles, about 90 miles of which, above Red Bluff, is more or less torrential and not navigable. The Sacramento River, Suisun Bay, San Pablo Bay, and San Francisco Bay form an inland water transportation system during 6 or 7 months of each year between Red Bluff and San Francisco, Oakland, and the other commercial centers of the three above-named bays and their tributaries, and during the entire year between Chico Landing and the bay points. The distance by this water route between Red Bluff and the city of San Francisco is 310 miles, and between Chico Landing and San Francisco 254 miles.

By their connection the Sacramento and San Joaquin Rivers also form an all-year-round water transportation system between points on the former and points on the San Joaquin and Mokelumne Rivers and the various branches and sloughs tributary thereto.

By their connection with San Francisco Bay the commerce of this network of inland waterways is afforded an outlet to the Pacific Ocean at San Francisco.

The Feather River has its source in the Sierras, flows westerly until it enters the Sacramento Valley in the vicinity of Oroville, then flows south through that valley and empties into Sacramento River at Verona, 20 miles above the city of Sacramento. Above Oroville the Feather River is a mountain stream. It was navigated by steamboats in earlier years up to Marysville, 30 miles above Verona. It is now visited by steamboats only occasionally.

The first appropriation by Congress was "for the improvement of the Sacramento and Feather Rivers, Cal." This appropriation was made March 3, 1875. At that time, due largely to the consequence of hydraulic mining, the depth on some of the bars in the Sacramento River in the 61 miles between its mouth, at Collinsville, and the city of Sacramento was but 4 feet, as compared with the depth of 7 feet which had previously existed. From Sacramento to Colusa, 90 miles, the stream was in favorable condition for navigation by boats drawing about 3 feet of water, but in the 107 miles from Colusa up to Red Bluff navigation was, as it is yet, difficult at numerous places on account of its changing and crooked channels, easily eroded banks, bars, and rapids. Many snags are also brought into this portion of the stream annually by high water. The bed of the Feather River had also been so filled up with débris from the hydraulic mines draining into it and its tributaries that navigation between its mouth in the Sacramento and the head of navigation, at Marysville, was practicable during the higher stages only, usually extending from December to June. The same is true at the present time.

The amount expended prior to operations under the existing project was $740,860.21.

The present project for improvement as adopted by the act of Congress approved March 3, 1899, and by subsequent acts, provides for obtaining and maintaining the following-named channel depths in the Sacramento River by continuing the work of removing snags and other obstructions and by the construction of wing dams to concentrate the flow at shoal places, at an estimated first cost of $280,000 and an annual expense of $25,000.

From—	To—	Miles.	Least channel depth to be obtained and maintained.
			Feet.
Mouth of river at Collinsville	Sacramento	61	7
Sacramento	Colusa	90	4
Colusa	Red Bluff	107	3
Total		258	

At the time the reports of the Board of Engineers above referred to were submitted the permanent improvement of the Feather River was not contemplated until the flow of sand and other mining detritus from the Yuba, Bear, and other tributaries should be stopped or the commercial interests involved became greater. Several appropriations have since been made, however, for the improvement of both the Sacramento and Feather Rivers.

The amount expended on the work of the existing project up to the close of the fiscal year ending June 30, 1912, was $287,694.27. Of this amount $37,212.71 was for original work and $250,481.56 for maintenance. The sum of $1,942.07 has been derived from sales of old property.

The expenditures have resulted in obtaining and maintaining all the year round the projected channel depths in the 202 miles of the Sacramento River from its mouth to Chico Landing, and the projected channel depth in the 56 miles from Chico Landing to Red Bluff during about seven months of each year.

The expenditures during the fiscal year ending June 30, 1912, were for maintenance of the channel between the mouth of the river and Chico Landing by removing snags, cutting overhanging trees, dredging several shoals, and constructing wing dams to concentrate the flow on bars.

The river and harbor act approved July 25, 1912, modified the project for Sacramento River above Sacramento in accordance with report printed in House Document No. 76, Sixty-second Congress, second session, so as to provide for securing and maintaining the following-named depths: Four feet from Sacramento to Colusa, 3 feet from Colusa to Chico Landing, and such depth as is practicable from Chico Landing to Red Bluff, at an annual cost of $25,000.

The following statement shows the present conditions for purposes of navigation of the Sacramento and Feather Rivers:

	Sacramento River.	Feather River.
Maximum draft that can be carried at low water.	San Francisco to Sacramento, 7 feet; Sacramento to Colusa, 4 to 5 feet; Colusa to Chico Landing, 3 feet; Chico Landing to Red Bluff, 2½ feet.	Mouth of river to Marysville, 1 to 2 feet.
Head of navigation	Red Bluff	Marysville.
Length, in miles, of navigable portions.	Mouth to Sacramento, 61 miles; mouth to Colusa, 151 miles; mouth to Chico Landing, 202 miles; mouth to Red Bluff, 258 miles.	Mouth to Marysville, 30 miles.

The extreme variation of level of water surface at Red Bluff is about 22 feet, at Collinsville about 8 feet. Tidal influence extends up the Sacramento River to about the city of Sacramento.

The Sacramento River is important as the means for transporting both freight and passengers, steamboats plying regularly all the year round between San Francisco and Chico Landing and during about seven months of each year (December to June) between San Francisco and Red Bluff. The freight carried on the Sacramento River by the five principal transportation companies during the year ending December 31, 1911, was 505,285 short tons, consisting principally of general merchandise, lumber, brick, grain, vegetables, and fruit. The value of the commerce carried was approximately $32,000,000. The number of passengers carried during the same period was 185,396. Extensive areas of the land along the Sacramento River are under a high state of cultivation. Much of the territory along the river is dependent upon the stream as a means of transportation for passengers and freight. The maintenance of the projected channels is important as much of the freight is of a perishable character and can not be subjected to delay when ready for market. In some instances the lower rates of the steamboat lines are met by railroads between the points where the two meet in competition. The traffic on the Sacramento is handled by approximately 50 steamboats, 75 gasoline boats and launches, 45 barges, and, in the lower portions of the stream, by a number of gasoline and sail schooners. Several new modern steamboats have been added to the Sacramento River trade during the past few years.

The existing project, as adopted by Congress, contemplates that the sum of $25,000 will be provided annually for maintenance of the navigable channels. Since this project was adopted, 13 years ago, the funds provided for maintenance have averaged somewhat less than $25,000 per annum, and it has been impracticable properly to maintain the extensive wing-dam system built in 1899–1903. Consequently the channel where it has been controlled in former years by the wing-dam system has, in recent years, shown signs of deterioration, which has made it necessary from time to time to resort to the more expensive method of dredging.

The wing-dam system aggregates approximately 8,800 linear feet in length. Due to natural decay and deterioration of the adjacent wing dams, the river channel at and below Sacramento has become so impaired that navigation was seriously interfered with in the summer months of 1909, 1910, and 1911. This is expected to occur each low-water season until the wing-dam system is restored to its former effectiveness.

It is essential that the old wing dams at the more critical points be restored to their former state of effectiveness during the fiscal year 1914, and a portion of the $40,000 referred to in the appended money statement as the amount required for expenditure during that year will be devoted to that work if the funds are provided. The remainder is necessary to remove snags and similar obstructions which are brought into the channel by the storms each winter.

All this is work of maintenance and is necessary to keep the improvement available.

Much of the country along a considerable portion of the Sacramento, Feather, and San Joaquin Rivers and their tributaries is subject to widespread overflow during the winter and spring months each year, the channels being unable to carry off the rainfall in the valleys and foothills and the melting snow in the mountains. Unrestricted hydraulic mining in earlier years has contributed largely to the difficulty by filling up the beds of the streams.

The interests of navigation, the problem of flood control, and the control and disposition of mine débris in and along the Sacramento and Feather Rivers and their tributaries, including also the San Joaquin River and its tributaries, are all inseparably connected. These matters are in charge of the California Débris Commission. More extended information concerning these subjects may be found in the documents and reports referred to in the summary of the report of the California Débris Commission for the current fiscal year.

Amount (estimated) required to be appropriated for completion of existing project	Indeterminate.
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	$40,000

SAN JOAQUIN RIVER, CAL.

This stream rises in the Sierra and flows first down the western slope thereof in a southwesterly direction until it reaches the trough of the San Joaquin Valley near Mendota, where it turns and flows northwesterly to Suisun Bay. The stream has a total length of approximately 350 miles. Tidal influence extends up to a point a short distance above San Joaquin Bridge, about 65 miles above the mouth. Up to San Joaquin Bridge the stream is navigated all the year round by boats drawing 2½ feet of water.

From 1884 to 1896 light-draft steamboats operated during the high and mean stages of each year, ranging from 3 to 10 months, as far up as Hills Ferry a distance of about 140 miles above the mouth. Since 1896 boats have occasionally gone, during times of high water, as far as Firebaughs, about 200 miles above the mouth. In June, 1911, a steamboat ascended as far as Skaggs Bridge, 10 miles below Herndon, which latter place is approximately 265 miles above the mouth.

Throughout its course in the San Joaquin Valley above Hills Ferry so much water is withdrawn for irrigation that that portion of the river during the low-water season, generally extending from August to February, is reduced to a series of pools separated by bars over which there is little or no flow. While San Joaquin Bridge is the actual head of practicable all year round navigation, the city of Stockton, at the head of Stockton Channel, about 50 miles above the mouth of the San Joaquin River, is the principal head of navigation, by reason of the fact that that city is the principal commercial center and distributing point of the region. Boats drawing 6 to 6½ feet ply between San Francisco and Stockton all the year round. The extreme range of tide at Stockton is 3½ feet.

The San Joaquin River below San Joaquin Bridge and its varous branches, sloughs, and tributaries, and Sacramento River, which joins the San Joaquin near its mouth, Suisun Bay, San Pablo Bay, and San Francisco Bay all go to form a large and important inland water transportation system.

Before improvement the main channel of San Joaquin River and Stockton Channel below Stockton were crooked and difficult to navigate, with a depth of 6 feet and less at low tide. Above Stockton the San Joaquin was obstructed by snags and numerous bars.

The project as it exists at this time is as follows:

San Joaquin River and Stockton Channel from Suisun Bay to the city of Stockton.—The project printed (with maps) in House Document No. 1124, Sixtieth Congress, second session, as adopted by the act of Congress approved June 25, 1910, provides for obtaining a channel having a 200-foot bottom width and 9-foot depth, at an estimated first cost of $240,000 and $25,000 annually for maintenance, to be accomplished by dredging and making two cut-offs.

Mormon Channel.—The existing project is the one adopted by act of March 3, 1881, and provides for maintaining a low-water channel 80 feet wide and 4 feet deep from Stockton Channel to Miller's Warehouse, at Center Street, in the city of Stockton, a distance of 1¾ miles.

Fremont Channel and McLeod Lake.—The improvement of these branches of the San Joaquin River with a view to affording additional harbor facilities in the city of Stockton, was authorized by the river and harbor act of July 25, 1912, in accordance with report printed in House Document No. 581, Sixty-second Congress, second session (with map), which contemplates dredging Fremont Channel and McLeod Lake to a depth of 9 feet at mean low water, at an estimated first cost of $11,000 and $500 annually for maintenance after completion.

San Joaquin River above Stockton.—The project (of 1881) is necessarily indefinite. A channel 3 feet deep all the year round in the 20 miles between the mouth of Stockton Channel and San Joaquin Bridge meets fairly the present needs of navigation, and the operations have been conducted with the view of maintaining such a channel. From San Joaquin Bridge up to Hills Ferry navigation is limited to occasional trips by light-draft steamboats during the high and mean stages of each year, and operations have consisted of aiding such navigation by removing the worst obstructions and concentrating the flow in the main channel by means of wing dams, and closing side channels.

The interests of navigation, the control of floods, and the control and disposition of mine débris in and along the San Joaquin and Sacramento Rivers and their tributaries are in charge of the California Débris Commission. More extended information on these subjects may be found in the various publications referred to in the summary of the annual report of the California Débris Commission for the fiscal year ending June 30, 1912.

The total amount expended prior to the project adopted by the act of June 25, 1910, was $572,977.64.

The amount expended since the adoption of the project by the act of June 25, 1910, up to June 30, 1912, was $41,412.96 for maintenance.

This work of maintenance has consisted of dredging shoals in Stockton and Mormon Channels to keep those channels open for navigation.

The operations during the fiscal year ending June 30, 1912, consisted of maintaining the projected channel in Mormon Channel. This involved the dredging of approximately 267,000 cubic yards of material from that channel.

Operations under the project adopted by the act of June 25, 1910, are being held in abeyance until the land needed in executing the project is transferred to the United States free of cost, as required by the act of June 25, 1910. It is expected that this will be done during the coming year.

The maximum drafts that may be carried at low water at the present time are as follows:

San Joaquin River.	Stockton Channel.	Mormon Channel.
Mouth to Stockton Channel, 6½ feet; Stockton Channel to San Joaquin Bridge, 2½ feet; San Joaquin Bridge to Hills Ferry, a few inches.	Mouth to Stockton, 6½ feet...	Mouth to Miller's Warehouse, 4 feet.

The commerce carried on the San Joaquin River above San Joaquin Bridge is very limited. Below that point, and especially below Stockton, the several branches of the river as well as the numerous sloughs and dredged cuts afford facilities for transporting the commerce of a large area of country under a high state of development, much of which country is entirely dependent upon water transportation for freight and passengers. Approximately 15 steamboats, 150 gasoline tugboats and launches, 40 barges, and 50 gasoline and sail schooners are engaged in this trade.

Freight rates by both water and rail are low, the railroads generally meeting the low rates by water.

Approximately 660,000 short tons of freight, valued at $33,000,000, is handled annually on the river.

The amount estimated as a profitable expenditure in the fiscal year ending June 30, 1914, for works of improvement, is the balance remaining to be appropriated by Congress to complete the project for a 9-foot channel from Suisun Bay to Stockton adopted by the act of June 25, 1910. To complete this project with due economy, and within the estimated cost, the $159,632.70 needed for completion should be provided at one time.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, for maintenance of improvement, is the amount it is estimated will be required to maintain the existing navigable channels in San Joaquin River, Stockton Channel, Mormon Channel, Fremont Channel, and McLeod Lake, by dredging material which may be brought into the channels by high water, and for maintenance of completed works for the rectification of Stockton and Mormon Channels. The maintenance of these channels at all times is important, as a large area of country is dependent upon them for transportation. Much of the freight is of a perishable character, and can not be subjected to delay when ready for market.

July 1, 1912, balance available	$59,162.58
Amount appropriated by river and harbor act approved July 25, 1912	[1] 51,000.00
Amount available for fiscal year ending June 30, 1913	[1] 110,162.58
Amount (estimated) required to be appropriated for completion of existing project	[2] 159,632.00
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	[2] 159,632.00
For maintenance of improvement	[2] [3] 26,500.00
Total	[2] [3] 186,132.00

SUISUN CHANNEL, CAL.

Originally Suisun Channel was a tidal inlet from Suisun Bay, Cal., varying in width from 80 to 600 feet and varying in depth from zero to 17 feet at mean lower low water. Navigation was possible only at the higher stages of the tide. Suisun Channel is about 17 miles long and is about 30 miles northeast of San Francisco Harbor.

The original (the present project) was adopted by Congress in river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 1110, Sixtieth Congress, second session, and provides for a harbor at Suisun 1,400 feet long by 150 feet wide and 6 feet deep at mean lower low water, and a cut-off 3,000 feet long, 80 feet wide on the bottom, and 6 feet deep at mean lower low water, from the basin to Peytonia Slough. The estimated cost is $25,000, and $2,000 annually for maintenance. The said act makes an appropriation of $12,500 and further provides that the land required for the cut-offs proposed shall be deeded to the United States, free of cost, before any part of the appropriation shall be expended.

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[1] Includes $11,000 for Fremont Channel and McLeod Lake branches of San Joaquin River in the city of Stockton.

[2] Exclusive of amount available for fiscal year 1913.

[3] Including maintenance of Fremont Channel and McLeod Lake and of completed works for rectification of Stockton and Mormon Channels.

This project has not been modified since its adoption.

During the year title was obtained to the necessary land for the cut-off contemplated by the project. The work of making the cut-off was begun in March, 1912, under contract. The material encountered was so soft that the banks could not be made to stand with the excavated material placed upon them. The contractor withdrew his dredge and had not done anything further on the work at the end of the fiscal year.

This is all new work and a total of $133.55 was expended during the year.

The initial work on the existing project was begun during the fiscal year and all expenditures have been applied to new work. There have been no receipts from sales and no reimbursements during the year.

No appreciable work has been done on project yet.

The shoalest parts of this channel were dry at low water on June 30, 1912. The tidal range is about 7 feet. The head of navigation is Suisun, Cal., and the length of the navigable portion is 17 miles.

The commerce of Suisun Channel for the year ending December 31, 1911, is given as 83,444 tons, valued at $535,726, and consists mainly of grain, lumber, building materials, canned goods, crude oil, and wool.

It is thought that the improvement when completed will cause a reduction in freight rates by affording competition with the railroads.

The amount estimated as a profitable expenditure during the fiscal year ending June 30, 1914, will be used to complete the cut-off and excavate a harbor at the town of Suisun, and for maintenance.

In view of the difficulties encountered in making the cut-off contemplated by the adopted project, it may prove desirable to secure the increased depth by way of the natural channel or other route, and it is recommended that authority be granted to modify the project in this particular should further investigation show the present layout to be impracticable on account of excessive cost.

Amount (estimated) required to be appropriated for completion of existing project	$12,500
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	14,500

ENTRANCE TO COOS BAY AND HARBOR, OREG.

Coos Bay is a tidal estuary on the Pacific coast, in Oregon, about 180 miles south of the Columbia River. Next to Humboldt Harbor, in California, it is the principal harbor between the mouth of the Columbia River and San Francisco. Its tidal area is about 15 square miles, which includes about 900 acres of anchorage area of not less than 18 feet at mean lower low tide.

In its original condition the bay ship channel to Marshfield was obstructed by several shoals, the controlling depth on Pony Slough Shoal being about 12 feet at mean lower low tide and on the Hogsback Shoal, near Marshfield, about 8 feet at the same stage.

Before improvement the entrance channel skirted the south headland and crossed the bar in a northwesterly direction, with a controlling depth of about 3 feet at mean lower low tide, as shown on map opposite page 2682 of the Annual Report of the Chief of Engineers for 1882, and was shoal and shifting and studded with dangerous rocks.

The bar channel did not exceed 100 feet in width and was available only for small coasting vessels drawing not to exceed 8 feet.

The original project was approved by the Secretary of War November 24, 1879, and provided for the construction of a jetty from a point about 250 yards below Fossil Point on a line toward the east end of Coos Head, the structure to be of wood and stone, or stone, as should be found best. A total of $213,750 was expended on this project, and 1,760 feet of jetty were constructed.

The project for increasing the depth across the bar to 20 feet was adopted by act of Congress approved September 19, 1890. The estimated cost was $2,466,412, and provided for the construction of a north jetty 9,600 feet long and a slightly converging south jetty 4,200 feet long.

The expenditures on this project amounted to $721,720.76, of which $196,721.32 was for maintenance. In addition to this, upward of $82,000 has been expended on the inner harbor for a low-water depth of 12 feet to the town of Marshfield. The amount derived from sales, etc., is $461.08.

The present project, adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 958, Sixtieth Congress, first session, and provides for constructing and operating a seagoing hydraulic dredge for deepening the channel over the bar and for dredging the channels within the bay, with a view to securing a depth of 18 feet up to the town of Marshfield. The estimated cost was $500,000 and cost of maintenance $60,000 annually. The above-mentioned act appropriated $350,000 for constructing the dredge and $50,000 to be applied to dredging in the inner bay.

The amount expended on the existing project to the end of the fiscal year ending June 30, 1912, was $73,449.81.

The dredging on this project to the present time has increased the depths over many of the shoals from a controlling depth of about 12 feet to one of at least 17 feet at low water. It is estimated that the dredging in inside channels covered by the project is about 90 per cent completed.

Plans were completed for the seagoing dredge for service on the bar, and contract for construction entered into with the Seattle Construction & Drydock Co., Seattle, Wash., under date of April 19, 1912. Actual construction has commenced and the contractors have 14 months in which to complete the contract.

The project depth of 20 feet on the bar was obtained in 1894 when the north jetty had been extended to a length of 9,520 feet. The outh jetty has therefore not been built, and the improvement has been made at a fraction of the estimated cost. It has resulted in a permanent channel of from 17 to 22 feet depth at mean low tide, close to and parallel with the north jetty. The variation of the water levels on account of the tide is about 4.8 feet. Ocean-going vessels ascend the bay to the town of Bay City immediately above Marshfield and about 14 miles from the mouth, above which point there is about 50 miles of available navigation for boats of light draft. The logging industry is very extensive, and is carried on throughout the whole year, large quantities of logs being floated from the headwaters to the mills along the bay.

The principal products are coal, lumber, farm and dairy products, live stock, woolen goods, and salmon. The imports consist of farm and mill machinery and miscellaneous merchandise. The total tonnage during the calendar year 1911 amounted to 303,008 short tons, valued at $7,097,617.

The bay and ocean form the only means of transporting products to outside markets, and the improvement has the effect of increasing the carrying capacity of vessels using the channel, with a consequent decrease of freight rates.

The appropriation recommended for the fiscal year 1914 will be applied to maintaining the completed channels in Coos Bay and to equipping and operating the bar dredge authorized by the river and harbor act of June 25, 1910.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Calendar years.	Short tons.	Estimated value.
1902	122,232	....	1907	167,562	$6,400,000
1903	135,178	....	1908	216,631	7,077,140
1904	136,958	$3,557,984	1909	281,008	7,968,610
1905	178,945	3,901,906	1910	242,942	7,377,088
1906	184,455	5,900,017	1911	303,008	7,097,617

Amount (estimated) required to be appropriated for completion of existing project	$60,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	80,000

NEHALEM BAR AND ENTRANCE TO NEHALEM BAY, OREG.

Nehalem Bay is an indentation of the Oregon coast about 2 miles long and 1½ miles wide at the widest part, with a tidal area of about 5½ square miles. It lies about 40 miles south of the entrance to the Columbia River. It is a small estuary at the mouth of the Nehalem River, which rises in the Coast Range of mountains about 30 miles east of the Pacific Ocean and drains an area of about 850 square miles. The bay is connected with the ocean by a shifting channel over a sand flat and has in an unimproved condition furnished channel facilities at high tide for vessels drawing about 10 feet. Navigation has, however, been hazardous as the cycle of changes in the channel has been short. The average range of tide is 5½ feet. The head of navigation for ocean-going vessels is Nehalem, about 7 miles above the entrance.

No work has ever been done on the bar by the General Government, although $10,000 was appropriated in 1890, of which $415.08 was spent for surveys and the remainder reverted to the Treasury.

The Port of Nehalem, a corporation organized under the laws of the State of Oregon, about two years ago, entered upon a project which was approved by the Secretary of War, and started the construction of a rubblestone jetty south of the entrance, and on this work had expended about $85,000 to the close of the fiscal year ending

June 30, 1912. Their work has resulted in temporarily fixing the channel across the bar in its most favorable position and slightly increasing its depth.

The existing project was adopted by the river and harbor act of July 25, 1912, and is the project approved by the Secretary of War, on which the Port of Nehalem has been operating. It is fully described in House Document No. 623, Sixty-second Congress, second session, and provides for the construction of two high-tide jetties, the south jetty to be an extension of the one constructed by the Port of Nehalem, and the north jetty to be based on the north spit, at a total estimated cost of $632,350, which includes the cost of the work already done, local interests cooperating to the extent of paying half the cost, receiving credit for the work already done.

The country is sparsely settled, but is heavily timbered with fir, spruce, and hemlock. There is small commerce at present, but it is believed that a large lumber industry will develop with the improvement of the bar channel. Salmon packing and cheese making are also established and growing industries. During the calendar year of 1911 the commerce consisted of about 18,199 short tons of salmon, lumber, cheese, and general merchandise, valued at $398,540.

There is railroad connection by a line recently completed and now in operation, leaving the Southern Pacific line at Hillsboro and passing through Nehalem to a terminus at Tillamook, about 15 miles farther south on the coast.

No work was done on the project during the fiscal year, it having been adopted by Congress subsequent to the close of the year. After the completion of the necessary guaranty required by the act, the construction of the south jetty will be continued. The amount required for expenditure for the fiscal year 1914 is for the completion of the south jetty, and is necessary in the continuation of the project.

Amount (estimated) required to be appropriated for completion of existing project	$216,175
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	100,000

COQUILLE RIVER, OREG.

The Coquille River rises in the Coast Range, flows about 100 miles in a northwesterly direction, and empties into the Pacific Ocean at Bandon, Oreg., about 375 miles north of San Francisco. Before improvement the channel at the mouth skirted the south headland for some distance, as shown on map opposite page 2682 of the Annual Report of the Chief of Engineers for 1882, and was shoal, shifting, and studded with dangerous rocks. The depth over the bar was usually about 3 feet at low tide and was available only for small coasting vessels.

The original project for improvement was adopted in 1878, and provided for the construction of two converging, high-tide jetties, built of rubblestone, 800 feet apart, so located as to cause the river to empty into the sea about one-half mile north of the original mouth of the river, these jetties to run out to sea a sufficient distance to create and maintain a channel 12 feet deep at low tide. In 1880 the proposed depth of 12 feet at low tide was reduced to 10 feet; in 1888 it was reduced to 8 feet, and under date of May 8, 1891, the plan was changed to provide that the jetties should be 600 feet apart at their outer ends instead of 800 feet.

The above changes, and the limitation of the length of the south jetty to 2,700 feet, and of the north jetty to 1,575 feet, by the act of July 13, 1892, constitute the previous project.

The amount expended on the original and modified project to the close of the fiscal year ending June 30, 1912, was $351,192.75, of which $48,351.07 was applied to maintenance.

The present project, adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 673, Sixty-first Congress, second session, and provides for the removal of snags between the mouth of the North Fork and Bandon, the removal of a midchannel rock at Rocky Point, and the rocks near the mouth of the river, dredging a low-water channel 140 feet in width through the Bandon Shoal, and 100 feet in width through other shoals up to Coquille, the channel to be 9 feet in depth between Coquille and Riverton, and 10 feet in depth between Riverton and the mouth, and the constructing of some regulating works, at an estimated cost of $50,000, with $6,000 annually for maintenance, all of which was appropriated by the act. No modifications in the existing project has been made.

The jetties have remained in fairly good condition, although their outer ends were beaten down slightly by the heavy seas. The depth in the bar channel has been well maintained, and not less than 8 feet at low tide was reported.

The amount expended on the existing project to June 30, 1912, is $54,148.15.

The Coquille River, from the entrance to Coquille, a distance of 25 miles, had a controlling depth at mean lower low tide of about 5 feet on several bars, with channel width varying from 50 to 500 feet, and was more or less obstructed by snags and submerged rocks near Bandon, but could be navigated for that distance by such vessels as could cross the bar. Between Coquille City and Myrtle Point, 12 miles above, the river was navigable for small light-draft steamboats at high tide in a channel with a controlling depth at low tide of not more than 1 foot. This part of the channel was much obstructed by snags, and in places less than 50 feet in width.

The tide rises about 4.2 feet at Bandon, near the mouth. Logging is carried on extensively on the headwaters for distances of 30, 26, and 18 miles above Myrtle Point on the North, South, and Middle Forks, respectively.

The freight is loaded on small coasting vessels along the 25 miles between Bandon and Coquille City and is usually taken to San Francisco. The total imports and exports during the calendar year amounted to 130,781 short tons, valued at $2,724,269. The exports consist principally of lumber, live stock, and farm products, and the imports of general merchandise, machinery, etc.

The improvement will increase the carrying capacity of vessels and have the effect of reducing freight rates on all shipments, as the ocean is the only available means of transporting the products to market.

No additional work is necessary to make the channel available.

The present project is expected to be completed about July 10, 1912, about 98 per cent of it now having been accomplished, which will insure a navigable channel of the depths and widths called for in the existing project to Coquille City.

The amount estimated as necessary for one year's maintenance, $6,000, will be required to maintain the project depths to Coquille City, as it is believed that all of the cuts have shoaled more or less since completion.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Calendar years.	Short tons.	Estimated value.
1902	37,458		1907	60,504	$1,367,634
1903	48,249		1908	68,426	1,375,938
1904	60,944	$1,322,058	1909	85,127	2,110,898
1905	45,455	1,105,750	1910	208,586	3,129,982
1906	67,288	1,119,716	1911	130,781	2,724,269

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement........ $6,000

MOUTH OF SIUSLAW RIVER, OREG.

The Siuslaw River rises in the Coast Range of mountains, flows for about 110 miles in a westerly direction, and empties into the Pacific Ocean at a point about 475 miles north of San Francisco, Cal.

The river between the entrance and Florence, throughout a distance of about 4 miles, has a width of from 500 to 1,000 feet, with controlling channel depths of about 8 or 9 feet at mean lower low tide.

It enters the sea through a shifting sand beach. The obstruction at the entrance is a shoal outer bar with deficient depth and shifting channel. The bar channel before improvement changed its position up and down the coast as much as 1 mile. The depth of water on the bar varied from 5 to 12 feet at low tide.

On August 4, 1891, the Secretary of War approved a project for improvement which provided for the construction of two rubblestone high-tide jetties 7,500 feet and 5,600 feet long, respectively, on the north and south sides of the entrance. The estimated cost of the improvement was $700,000. By these jetties it was expected to keep the channel in a fixed position and to increase the depth to 8 feet at low tide in the bar channel.

This project has been only partially carried out. Four thousand and ninety feet of the north jetty has been built, at a cost of $151,700.83 in original construction and $10,611.27 in maintenance, surveys, etc. Nothing was done on the south jetty. The north jetty has had the effect of somewhat checking the tendency of the bar channel to shift its position as far to the north as frequently occurred before the jetty was built, but the expected depth at low tide in the bar channel has not been realized.

Upon the recommendation of the Board of Engineers for Rivers and Harbors, Congress provided in the river and harbor act of March 3, 1905, that the unexpended balance be returned to the Treasury, except an amount sufficient for maintenance for two years.

The plant used during construction was disposed of and the balance remaining to the credit of the appropriation accordingly turned into the general fund of the Treasury and the work abandoned.

By river and harbor act of June 25, 1910, Congress again adopted a project for improvement, which is printed as House Document No. 648, Sixty-first Congress, second session. The plan proposes the construction of two mean high-tide rubblestone jetties, the north jetty to extend from a point near the end of the old jetty westerly, on a curve of 4,000 feet radius, along the edge of the north spit for a distance of about 3,700 feet, the south jetty to extend northwesterly, on a curve of 2,350 feet radius, across the south pit for a distance of about 4,200 feet, the two jetties being 750 feet apart at their extremities. Estimated cost, $426,000, with $5,000 annually during construction for maintenance and repairs.

The act appropriated $50,000 and authorized continuing contracts not exceeding $165,500, and provided that the port of Siuslaw or other local agency shall furnish the sum of $215,500, in funds or accomplished work. The amount authorized is sufficient to complete the project.

Work was started by the port of Siuslaw during the year 1910, and a contract was made by the port for extending the south jetty as far as their available funds, amounting to $100,000, would permit. Preliminary work commenced in February, 1910, and was completed in June, 1911, when 2,940 feet of tramway had been built and about 65,500 tons of rock emplaced, at a cost of $89,509.11. Nearly all of this work was done during the fiscal year ending June 30, 1911.

The sundry civil act approved March 4, 1911, appropriated $50,000 additional to carry on the work under the project in connection with the port of Siuslaw during the fiscal year ending June 30, 1912.

The provisions of the river and harbor act of June 25, 1910, were amended by the river and harbor act of February 27, 1911, to provide that the port of Siuslaw might proceed with the construction of the south jetty in pursuance of the contract with Robert Wakefield, entered into December 24, 1909, to the full extent of said contract; and the amount to be furnished by the port of Siuslaw or other agency to be reduced by such amounts, not exceeding $100,000, as may be expended under the said contract, provided that all the work so done shall be in accord with the adopted project and satisfactory to the Secretary of War.

As soon as the port had raised the required amount by the sale of bonds, and it was made available, advertisement was issued for the completion of the remaining portion of the work under the project by contract, and contract was entered into with Johnson-Anderson Co., Portland, Oreg., under date of December 1, 1911, for construction of a receiving wharf and extending north jetty, for the sum of $200,686. Work was commenced thereon January 10, 1912, to be completed in March, 1915.

The amount expended on the existing project to the end of the fiscal year ending June 30, 1912, was $22,654.18, all for improvement, not including the amount expended by the port of Siuslaw.

No modification has been made in the existing project.

There has been no marked increase in the bar channel depth. The depths, however, appear to be more stable than formerly. The usual depths found on the bar at high tide range from 11 to 14 feet. The maximum draft that could be carried over the bar at mean low water when last survey was made was about 7 feet. The high-water line on the south spit has advanced northerly along the newly constructed jetty a distance of fully one-fourth of a mile. The average range of tide is about 5.2 feet, and vessels generally cross the bar at the time of high tide. Vessels which enter the bay can ascend 6 miles to a point a short distance above Florence with little difficulty.

The head of navigation for light-draft boats is at the head of tidewater, about 15 miles above Florence.

The commerce of Siuslaw is limited at present, the country being thinly settled and transportation facilities primitive. The river and ocean form the only means of transportation, and any increase in depths and permanency in location in the bar channel would be of great benefit in lessening the cost of marketing the products. There are tributary to the port extensive logging interests, besides salmon canning and dairy products, the sawmills having a combined daily capacity of 150,000 feet of lumber. The mills, however, are not operated constantly, the freight rate to San Francisco being $2 higher than from Coquille River, and $1.15 higher than from Coos Bay, with but a slightly longer haul.

Since active operations have been commenced on jetty construction and on the projected line of railway from Eugene, Oreg., down the Siuslaw River to the mouth, and thence to Coos Bay, considerable activity is in evidence in the lumber industry, and it is expected that the shipments will soon be considerably increased.

The amount recommended for expenditure is to be applied to work under the approved project.

July 1, 1912, amount covered by uncompleted contracts	[1] $212,679.08
Amount of continuing contract authorization, act of June 25, 1910	165,500.00
Amount appropriated under such authorization	85,000.00
Amount yet to be appropriated	80,500.00
Amount (estimated) required to be appropriated for completion of existing project	80,500.00
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	80,500.00
For maintenance of improvement	[1] 5,000.00
Total	[1] 85,500.00

WILLAMETTE RIVER ABOVE PORTLAND AND YAMHILL RIVER, OREG.

The Willamette River rises in the Cascade Range, flows northerly and generally parallel to the coast line of the Pacific Ocean, and empties into the Columbia River about 100 miles from the sea. It drains an area between the Coast and Cascade Ranges of approximately 19,550 square miles. The river proper is formed by the junction of three main tributaries, which unite in the vicinity of Eugene; these are the Coast Fork, the Middle Fork, and the McKenzie. Approximate distances are as follows:

	Miles.
Mouth to Portland	12
Portland to Eugene	172
Eugene (up Middle Fork) to source	110
Total length	294

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[1] One-half to be furnished by local interests.

The original project included 172 miles of the river from Eugene to Portland, which latter point is 12 miles from the mouth.

The Yamhill River is a tributary, which has its source in the Coast Range, flows in a northeasterly direction, and enters the Willamette River about 42 miles above Portland. About 12 miles from the mouth the river branches into the North Fork and the South Fork, the source of the former being about 25 miles and the latter 40 miles above the junction. The project covers the lower 18 miles from its mouth to the town of McMinnville, on the South Fork.

Prior to improvement the Willamette was obstructed by drift, snags, rock ledges, and rapids, and gravel shoals, which prevented navigation during low-water stages, similar conditions existing on the lower 18 miles of the Yamhill River.

The existing project is the project of 1896, as modified in 1904, and provides for securing and maintaining by dredging, dam, and revetment work, and snagging, a low-water depth of 2½ to 3½ feet from Corvallis to Oswego, and a low-water depth of 12 feet thence to Portland, for snagging only between Corvallis and Harrisburg, and for maintenance of channel in Yamhill River up to McMinnville by removal of obstructions. All of the revetments covered by this project have not been constructed.

The river and harbor act approved July 25, 1912, again modified this project in accordance with plan printed in House Document No. 438, Sixty-second Congress, second session, so as to provide for the improvement of the Willamette River between Portland and Oregon City by securing a navigable depth of 6 feet at low water, and a channel width of 150–200 feet below the head of Clackamas Rapids, and width of 100 feet above; also the removal of Copeleys Rock, at an estimated cost of $24,000 for first construction, with $2,500 annually for maintenance.

The total amount expended on the existing project to the close of the fiscal year ending June 30, 1912, was $500,270.69, of which amount $275,331.89 was applied to maintenance. Of this amount $250,257.67 was expended on the project of 1896 (including $72,164 for constructing lock and dam in the Yamhill River and $3,000 expended on the Long Tom River) and $249,713.02 on the modified project of 1904.

Receipts from miscellaneous sources amounted to $562.01.

About 75 per cent of the approved project has been completed. A proposed new revetment at Albany and one at Salem remain to be constructed when conditions require and appropriations permit. The work done on the Willamette River has greatly improved its condition, although annual maintenance is required to furnish a navigable channel at medium stages to Corvallis, 119 miles above Portland, and during low water to Independence, 83 miles above Portland, and to Dayton, on the Yamhill, 5 miles above the mouth. The work done on the Yamhill has been the completion of the lock and dam near Lafayette, 8 miles above the mouth, under the project of 1896, and clearing the channel of obstructions.

At low-water stage a maximum draft of about 3 feet, 2 feet, and 1½ feet can be carried from Portland to Oregon City, Salem, and Corvallis, respectively.

The variation of water surfaces due to freshets is from 20 to 30 feet, while the tide on low-water stages sometimes affects the levels between Portland and Clackamas Rapids to the extent of from 1 to 2 feet.

The improvement covers the whole stretch of the river between Portland and Harrisburg, although the old canal, one-half mile long, constructed by private parties around the falls at Oregon City, may be considered as dividing the navigable portion of the river into two parts, about 12 and 140 miles long, respectively.

The head of navigation on the Willamette is Harrisburg, 152 miles above Portland, but boats reach the former point only on the higher stages. The head of navigation on the Yamhill is McMinnville, 18 miles from the mouth, but boats seldom go above Dayton, 5 miles from the mouth.

The forests adjacent to the Willamette Valley produce large quantities of logs, and almost all of the tributaries are used for logging purposes. The Willamette is navigable for rafting 184 miles, and for floating loose logs, 209 miles above its mouth. Logs come down the Yamhill for a distance of about 50 miles.

The commerce consists of lumber, grain, hay, hops, potatoes, fruit, and garden truck. This commerce, including general merchandise and supplies received and logs towed, amounted during the calendar year 1911 to 875,740 short tons, valued at $9,020,565.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Passengers.	Calendar years.	Short tons.	Estimated value.	Passengers.
1901	191,901	....	103,971	1907	412,846	$8,193,746	41,998
1902	192,227	....	95,221	1908	403,148	8,014,164	29,029
1903	236,823	....	66,510	1909	519,250	9,295,384	43,299
1904	332,130	$11,260,196	65,947	1910	787,497	8,332,247	26,714
1905	362,258	12,119,596	67,396	1911	875,740	9,020,565	25,282
1906	383,911	7,591,623	41,160				

The lands of the Willamette Valley are very rich and productive, and the products are annually increasing, as shown by the comparative statement above. The river furnishes an easy means of transportation and is in condition to carry a large proportion of these commodities.

The Southern Pacific Railway parallels the river on each side, and the Oregon Electric Co. is operating an electric line between Portland and Salem. This line has been extended as far as Albany, and will soon be operated to that point and eventually to Eugene.

Although the locks in the Yamhill River are little used, these locks, together with the water transportation furnished by the Willamette, are instrumental in reducing the freight rates on all shipments from valley points. Until the United States assumes the operation of the canal and locks around the falls of the Willamette at Oregon City the full effect of the project on freight rates will not be felt. A charge of 50 cents per ton is now made for all freight which passes through the locks.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, will be applied to completing the improvement of the channel between Portland and Oregon City, in accordance with the new project adopted by the river and harbor act of July 25, 1912, and to the maintenance of this channel; also to such dredging, snagging, and repairs to existing works above Oregon City as are necessary for the maintenance of the available channel. Revised plan and estimate for improving the Willamette River between Oregon City and Eugene, printed in House Document No. 13, Sixty-second Congress, first session, has not been adopted by Congress.

Amount (estimated) required to be appropriated for completion of existing project	$67,020
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	42,000

YAQUINA RIVER, OREG.

The following letter of the Chief of Engineers submitting a report on a recent survey is printed in House Document No. 519, Sixty-second Congress, second session.

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, February 5, 1912.

SIR: I have the honor to submit herewith, for transmission to Congress, reports dated August 17, and December 27, 1911, with maps, by Maj. J. J. Morrow, Corps of Engineers, on preliminary examination and survey, respectively, of Yaquina River, Oreg., from Toledo to Yaquina, including a report upon a proposition for cooperation by local interests, prepared in pursuance of a call in the river and harbor act of February 27, 1911.

Yaquina River has previously been the subject of preliminary examination at the call of Congress, but has never been improved by the United States. The improvement desired is a channel in the river and in Depot Slough of similar depth to that across the bar at the bay entrance (12 feet at mean lower low water) so that vessels able to cross the bar may pass unobstructed up to Toledo, 9 miles above Yaquina, where the principal sawmills are located.

Sufficient depth already exists to above Oysterville, 2½ miles above Yaquina, and the district officer has prepared a plan for securing, mainly by dredging, a channel thence to a point just below the Fir & Spruce Lumber Co.'s dock at Toledo, 10 feet deep at mean lower low water, 200 feet wide on bottom in Depot Slough, and 150 feet wide in straight reaches and 200 feet on curves in the river, at an estimated first cost of $72,000. Maintenance work is estimated to cost $3,000 every two years if the dredge which the port of Toledo possesses remains available for use.

Improvement of the river has been commenced by the community interested organized under State law into a port district, which has available about $44,000 to be applied directly to improvement in line with the above plan, making a contribution of about 60 per cent. The first cost of the work to the United States will therefore be about $28,800.

In the opinion of the district officer it is advisable for the United States to undertake this improvement on a basis of a 60 per cent contribution by the port of Toledo, either in cash or in useful work performed, subject to the condition that the floating plant belonging to the port be made available for the work and for maintenance without cost to the United States other than for upkeep while in use. He further states that if the work is authorized during the present session of Congress an initial appropriation of $10,000 would be sufficient, the balance to be provided in the next ensuing river and harbor act; otherwise the entire amount should be made available in a single appropriation.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, to whose accompanying report, dated January 16, 1912, attention is invited. The board, with the division engineer, concurs in the recommendation of the district officer.

After due consideration of the above-mentioned reports, I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of Yaquina River, Oreg., from Toledo to Yaquina, is deemed advisable so far as to secure an available channel depth of 10 feet at mean lower low water, 200 feet wide in Depot Slough, and 150 feet wide, increased to 200 feet on curves in the river, following in general the methods described in the report of the district officer, at an estimated cost of $72,000 for first construction and $3,000 biennially for maintenance, provided local interests contribute 60 per cent of the estimated first cost, either in cash or useful work performed, prior to actual construction work by the United States, and that the floating plant belonging to the port of Toledo will remain available for use by the United States on work of construction and of maintenance without cost to the United States other than for upkeep while in use. These estimates are based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under a first appropriation at the present session of Congress of $10,000, and a subsequent appropriation at the next session of $18,800, or preferably that the full amount of the estimated cost to the United States will be made available in a single initial appropriation.

Very respectfully,

W. H. Bixby
Chief of Engineers, U. S. Army.

The Secretary of War.

The river and its tributary slough are used for logging purposes and by the farmers and others who own gasoline launches and small barges on which they transport wood, hay, and other products to market and bring back supplies. Two small gasoline seagoing boats make regular trips between Toledo and Portland, Oreg., carrying freight and passengers. About 12,000 tons of lumber are shipped out annually by water and a considerably larger tonnage by rail. Lumber will undoubtedly be the largest item of freight shipments, it being claimed that there are 12,000,000,000 feet of timber in the valley of the Siletz River, from 10 to 20 miles north of the Yaquina River, which should find an outlet to market by way of Depot and Olalla Sloughs. A logging road 4 miles long has already been built along Olalla Slough, and rights of way secured for another road along Depot Slough.

COLUMBIA AND LOWER WILLAMETTE RIVERS BELOW PORTLAND, OREG.

The Columbia River rises in British Columbia, flows northerly, then southerly and westerly and forms in its lower portion, for about 330 miles, the boundary between the States of Oregon and Washington, emptying into the Pacific Ocean about 610 miles north of the harbor of San Francisco and about 160 miles south of the Straits of Juan de Fuca. Its estuary forms the largest harbor on the Pacific coast between those two points and has an area of approximately 14 square miles with a depth of about 24 feet or over at mean lower low water. Its length from its source to the mouth is about 1,000 miles. A description of the Willamette River is given in report on its improvement above Portland, Oreg.

Passing through a gorge in the Cascade Range, the Columbia River forms a natural highway for all commerce originating east of those mountains, and in early days was the only means of transportation. By means of a rail portage around Celilo Falls and also around the rapids near the present site of Cascade Locks, a water outlet was afforded many years ago for the products of the northwest section of the country to Portland and thence by deep sea craft to the markets of the world. The value and availability of the waterway for purposes of commerce at the present time are illustrated by the fact that Portland is one of the principal grain-exporting cities of the United States.

The portions of these rivers covered by the improvement include 12 miles of the Willamette between Portland and its mouth, and 98 miles of the Columbia from the mouth of the Willamette to the Columbia River bar.

Originally the channel between Portland and the sea was obstructed by numerous sand bars which distributed the water over extended areas forming comparatively narrow channels with depths varying from 10 to 15 feet at low water.

Prior to the adoption of the project, dredging had been done for temporary relief, and the sum of $221,780.46 expended for that purpose. The original project was adopted in 1877, with a view to obtaining a channel depth of 20 feet. In 1891 the project was extended, with a view to obtaining a low-water channel of 25 feet, at an estimated cost of $772,464, and the Port of Portland Commission, a corporation existing under the laws of the State of Oregon, was granted permission to assist in the work. On the original and modified project, exclusive of the amounts named above, there has been expended the sum of $1,080,874.11. This does not include any part of the expenditures which have been made by the Port of Portland Commission.

The existing project was adopted by the act of June 13, 1902. It is based on report of survey made in 1900, and printed in the Annual Report of the Chief of Engineers for 1900, page 4418, and in House Document No. 673, Fifty-sixth Congress, first session, with maps. It provides for a 25-foot channel by the construction of contracting works and by dredging. The estimated cost was $2,796,300, with $175,000 as the cost of a new dredge and accessories. The act of June 25, 1910, provided for dredging the west channel at Swan Island for use of log tows and shoal-water boats. The river and harbor act of February 27, 1911, made an appropriation of $350,000 and further extended the project to include the construction of two suitable dredging plants.

The existing project provides for securing a channel 25 feet deep at low water between Portland and the mouth of the Columbia River by the construction of contracting works and by dredging, for a channel on the west side of Swan Island for use of log tows and shoal-water boats, and for the construction of two suitable dredging plants.

The total amount expended on this project to the end of the fiscal year was $1,206,668.16, which includes $304,385.57 expended by the Philadelphia district for dredge construction; $32,288.40 for dredging the 8-foot channel on the west side of Swan Island; $6,500 for the oil station at Three Tree Point; $24,603.37 for reconstructing the tug *G. H. Mendell;* and $2,000 for plans and specifications of dredging plants.

It may be stated that all the above expenditures, except the five items named, have been applied to maintenance, as operations were confined to dredging the channel and making repairs or alterations to controlling works and plant.

The total amount received from miscellaneous sources, account sales, etc., is $4,770.47. For depositing dredged material on shore the sum of $9,941.25 was received, which under a decision of the Comptroller of the Treasury was deposited to the credit of "Miscellaneous receipts."

Plans and specifications for two complete dredging plants, with tenders, pipe lines, pontoons, etc., were completed and submitted, but at the end of the fiscal year had not been finally approved by the Chief of Engineers and the contracts for construction had not been entered into. Of the $320,000 covered by the continuing contract authorization in act of February 27, 1911, $200,000 was carried in the sundry civil act of August 24, 1912, and $120,000 remains to be appropriated.

The dredging has been of great benefit to the deep-sea vessels, as there has been no time during the year when ships could not safely load to a draft of 25 feet by taking advantage of the tide. None of the permanent works provided for in the approved project has been constructed, but with this exception the project may be considered completed, as the depth of 25 feet has been practically secured. A new project for a 30-foot channel called for by the act of March 3, 1909, has been submitted to Congress, and was adopted by the river and harbor act of July 25, 1912, the dredging plants provided for in the project having already been authorized by the act approved February 27, 1911.

This project provides for a channel 30 feet deep, 300 feet wide, with a short auxiliary channel 8 feet deep, 300 feet wide, on one side of Swan Island, near Portland, to be accomplished partly by the construction of dikes and revetments, but chiefly by dredging, at an estimated cost of $3,770,000, including $520,000 for construction of two dredges. (Printed in H. Doc. No. 1278, 61st Cong., 3d sess.) As the Port of Portland Commission offers substantial cooperation, the probable first cost of the improvement to the United States will not be more than about $3,000,000.

The ruling depth prior to the summer freshet from Portland to the sea was 24 feet at low water, an increase of about 10 feet since the commencement of the work. By taking advantage of the tide vessels have safely carried a maximum draft of 26½ feet.

The usual variations of water level, due to tides, are from 2 feet at Portland to 7 feet at Astoria, and on account of freshets the variations are from 21 feet at Portland to zero at Astoria.

Length of improved sections:	Miles.
Columbia River Bar to mouth of Willamette River (tidal)	98.00
Mouth of Willamette River to Vancouver, Wash. (tidal)	6.00
Falls at Cascade Locks (canal and locks) (nontidal)	.63
Between the foot of Dalles Rapids and head of Celilo Falls (canal and locks) (nontidal)	12.00
Between Celilo and mouth of Snake River (nontidal)	124.00
Between Wenatchee and Bridgeport, Wash. (nontidal)	80.00
Between Bridgeport and Kettle Falls (nontidal)	162.00
Mouth of Willamette to Portland (tidal)	12.00

The head of deep-water navigation is at Portland, Oreg., on the Willamette River, 110 miles above the mouth of the Columbia. Light-draft boats ascend the Willamette for 150 miles, and by using the State portage road between Celilo and Big Eddy cargoes of light-draft boats, during high stages, reach Pittsburg Landing, a point on the Snake River 537 miles above the mouth of the Columbia. The Columbia and Willamette Rivers, over this stretch, probably form the greatest waterway for logging and rafting purposes in the United States. Lumber and shingle mills are located along the banks, and logs are floated down all the tributaries from points 20 to 90 miles inland and towed to the different mills to be manufactured. During the calendar year 1911 eight rafts of logs and piling timbers, aggregating, approximately, 51,500,000 feet b. m., were made up in the Columbia River and towed to San Francisco and southern California ports.

The export commerce consists principally of grain and lumber, while the imports are composed principally of oriental products, cement, coal, lime, sulphur, etc. The light-draft tonnage is chiefly dairy, farm, and lumber products and miscellaneous machinery and mercantile supplies.

The total commerce handled during the calendar year 1911 amounted to 8,000,914 short tons, valued at approximately $83,157,608.

Comparative statement of traffic handled on Columbia and lower Willamette Rivers, below Portland, Oreg.

Calendar years.	Handled by seagoing vessels.		Handled by river vessels.		Total.	
	Short tons.	Estimated value.	Short tons.	Estimated value.	Short tons.	Estimated value.
1901	669,284		1,534,780		2,204,064	
1902	1.131,426		1,567,336		2,698.762	
1903	832,184		1,596,220		2.428,404	
1904	778.328	$27.281,302	1,905.451	$30,775,609	2,683,779	$58.056,911
1905	946,805	31,786,607	2.313,153	26,712,339	3,259,958	58.498,946
1906	1,200.973	34.407.991	2.331,121	26,377,640	3.532,094	60.785,631
1907	1,664,717	45.000.000	2,586,964	31.583,804	4,251,681	76,583,804
1908	1,688,331	43,000.000	2.927.041	27,509,475	4,615,372	70,509,475
1909	1.597.787	40.200,874	2.865.221	33,261,731	4,463,008	73.462,605
1910	2,440,956	39.765,404	5,393,317	25,116.602	7,834,273	64.882.006
1911	2,449,297	52,104,230	5,551,617	31,053,378	8,000,914	83,157,608

It is not believed that the completion of the project will have any effect on freight rates until greater depths are obtained over the bar at the entrance to the Columbia River, thus allowing the use of ships of greater draft and carrying capacity.

The amount estimated as a profitable expenditure in fiscal year 1914 will be applied to completion of dredging plants, to operation of dredges in securing the 30-foot channel, and to maintenance of such old works as may be necessary to make the improvement available.

Amount of continuing-contract authorization, act of Feb. 27, 1911	$320,000
Amount appropriated under such authorization	200,000
Amount yet to be appropriated	120,000
Amount (estimated) required to be appropriated for completion of existing project	[1] [2] 2,575,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] [3] 280,000

MOUTH OF COLUMBIA RIVER, OREG. AND WASH.

The mouth of the Columbia is about 610 miles north of the entrance to San Francisco Harbor and 160 miles south of the Straits of Juan de Fuca, and forms the largest and deepest entrance on the Pacific coast between those two points. The estuary furnishes excellent fresh-water harbor facilities, which also extend up the stream to Portland, Oreg., a distance of 110 miles. A description of the Columbia River is given in the report on Columbia and lower Willamette Rivers below Portland, Oreg.

Prior to the commencement of the work of constructing the south jetty in 1885 there were from one to three channels across the bar, and these channels varied from time to time both in location and depth. The depths were from 19 to 21 feet at low water, while the location shifted through nearly 180° between Cape Disappointment and Point Adams.

The first project was adopted in 1884, and provided for the construction of a low-tide jetty, 4½ miles in length, extending seaward from Point Adams, on the south side of the entrance, and terminating at a point about 3 miles south of Cape Disappointment. It was to be built of rubble stone, with a foundation of brush mattresses. This project was modified in 1893 to provide for raising the jetty to high-tide level, and for building four groins from 500 to 1,000 feet in length on the north side.

The estimated cost was $3,710,000, and the jetty was completed to a length of 4½ miles in 1895, and increased the depth over the bar to 31 feet. The total amount expended on the original project was $1,968,753.14, prior to which $17,500 had been appropriated and expended for survey, etc.

The present project was formulated for the purpose of arresting the shoaling process which commenced soon after the completion of the work, the depth having decreased to about 28 feet in 1899, and the location of the channel having shifted into an unstable position 2 miles north of the 1895 channel. By 1902 the depths had deteriorated to 21 feet at low water.

The first appropriation for a new project was made by the act of June 6, 1900, when $250,000 was appropriated for repairs, etc., pending a report to be made by a board of engineers. The report of this board, which is printed in the Annual Report of the Chief of Engineers for 1903, pages 2275 et seq., constitutes the existing project, and provides for extending the jetty seaward a farther distance of about 2½ miles. Dredging was also recommended as a temporary expedient, as well as the construction of a north jetty, should it be found necessary at some future time, in order to secure the desired depth of 40 feet, with a practicable width.

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[1] Exclusive of amount available for fiscal year 1913.
[2] Exclusive of amount to be contributed by the port of Portland.
[3] Of this amount $120,000 is for continuing-contract work authorized by the act of 1911.

This project was approved by the Secretary of War March 16, 1903, and definitely adopted by Congress by act of March 3, 1905.

The estimated cost of the south jetty was $2,260,000; of the north jetty, $1,205,000; of remodeling and operating dredge, $250,000.

The revised estimate, approved April 17, 1909, for completion of the south jetty was $3,529,300, and is based on a report made by the district officer, recommending that the jetty enrockment be raised to at least mid-tide level, and that its crest be given a width of not less than 25 feet, in order to protect the trestle piling from early destruction by storms and teredo. The increased cost is due to the greater amount of stone required, the increase in cost of materials, and the heavy loss, during construction in previous years, due to destruction of the trestle by winter storms and teredo. In some places the jetty was built in depths as great as 65 feet, and with 15 feet increase in the width of its crest it becomes at once evident that an enormous increase in the amount of rock is required.

The existing project provides for extending the south jetty to a length of about 7 miles, the height to be not less than mid-tide level and width of crest not less than 25 feet; for constructing a north jetty about 2½ miles long, and for dredging to assist the jetties in securing a depth of 40 feet across the bar at mean lower low tide.

There has been expended on the existing project to the end of the fiscal year the sum of $7,865,112.16, of which $287,564.10 was expended for alterations, repairs, and operation of the dredge *Chinook*, and may be considered as applied to maintenance. The portion derived from miscellaneous sources, account of sales, amounted to $1,870.94.

The proportion of the project accomplished to the end of the fiscal year is approximately 92 per cent for south jetty and less than 1 per cent for north jetty.

The advantage derived from the improvement has been the increase of about 9 feet in depth on the bar since the adoption of the project.

While the depth in the best channel, referred to the plane of mean lower low water, is not less than 27½ feet, the maximum draft that can be safely carried across the bar on June 30, 1912, may be stated as 25 feet. The plane of mean low water is about 1.3 feet higher than the plane of mean lower low water to which soundings are reduced on the maps.

By taking advantage of the tide, a draft of 27 feet can be safely carried in ordinary weather.

The variation of the level of water surface, due to tides, is about 7.4 feet. The head of navigation for deep-sea vessels crossing the bar is at Portland, 110 miles above the mouth.

Comparative statement of traffic over Columbia River Bar.

Calendar years.	Short tons.	Estimated value.	Calendar years.	Short tons.	Estimated value.
1901	669,284		1907	1,664,717	$45,000,000
1902	1,131,426		1908	1,688,331	43,000,000
1903	832,184		1909	1,597,787	40,200,874
1904	778,328	$27,281,302	1910	2,440,956	39,765,404
1905	946,805	31,786,607	1911	2,449,297	52,104,230
1906	1,200,973	34,407,991			

Deepening of the channel over the bar will admit of the use of ships of greater draft and increased carrying capacity, and with larger vessels frequenting the port it is reasonable to suppose that the charter rates on deep-sea tonnage will be reduced, and that the present rail rates on transcontinental shipments may also be reduced.

The life of the trestle is very uncertain and the work of reenforcing the rock must be done before the trestle becomes unserviceable. It is believed that the contraction of the entrance width by the north jetty may be followed by scouring along the north side of south jetty and that for the maintenance of south jetty two or more groins should be provided, each about 500 feet long.

The amount estimated as a profitable expenditure in fiscal year 1914 will be applied to maintenance of south jetty and to continuing work on north jetty, which is necessary in order to secure the depth on the bar provided for in adopted project.

Amount (estimated) required to be appropriated for completion of existing project	[1] $955,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	[1] 1,000,000

CANAL AT THE CASCADES, COLUMBIA RIVER, OREG.

This improvement embraces about 4½ miles of the Columbia River where it passes through the Cascade Mountain Range and is contracted into a narrow gorge with steep slopes and swift current. A fall of 24 feet at low water in the upper 2,500 feet of the gorge creates a turbulent rapid which effectually bars upstream navigation and renders downstream navigation unsafe. The lower 4 miles of the gorge is swift and before improvement was unsafe by reason of the obstructing ledges and bowlders. The lower end of this improvement is about 155 miles from the mouth of the river.

The original project was for a canal and locks around the falls. It was adopted in 1877 and modified in 1886 and 1888, and included the improvement of the rapids below the falls to secure a low-water channel of 8 feet. The locks were to be about 462 feet long and 92 feet wide, with a low-water depth of 8 feet over the miter sills.

The existing project is a modification of the original project and is based on report of the Board of Engineers printed in the Annual Report of the Chief of Engineers for 1895, page 3571. It provided for utilizing the upper 426 feet of the uncompleted canal above the lock gates as a second lock, and also in raising the protection work of the canal walls as a safeguard against flood water. The estimated cost of the original project was $2,544,545, and the later modification $413,360.

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[1] For north jetty only.

The amount expended on the original and modified projects to the close of the last fiscal year was $3,823,993.69. There has been received on account of sales the total sum of $11,629.48.

No work was done during the fiscal year on the uncompleted items of the approved project, except to care for the plant and buildings, as sufficient funds for construction work were not available.

The canal and locks were completed and opened to navigation in 1896. There yet remains the building of the land wall of the upper lock, construction of three sets of steps, and completing the paving and grading on the land side of the canal. About 8 feet can be carried at low water through the locks. An annual rise in the Columbia River takes place in May, June, or July, and usually reaches a stage of 40 feet above low water. The head of navigation for boats passing the locks is Big Eddy, about 4 miles above The Dalles. No logs are rafted through the canal, but logging is carried on extensively between Cascade Locks and The Dalles.

Comparative statement of traffic.

Fiscal year ending June 30—	Short tons.	Estimated value.	Passengers.	Fiscal year ending June 30—	Short tons.	Estimated value.	Passengers.
1903	36,181	....	50,821	1908	54,954	$3,297,240	86,615
1904	31,967	....	76,971	1909	34,168	2,050,000	70,482
1905	35,166	$2,286,125	64,403	1910	32,794	1,927,352	93,369
1906	46,884	2,813,040	133,070	1911	38,063	2,543,799	96,810
1907	53,770	3,226,200	89,239	1912	41,778	3,034,315	84,925

The commerce through the locks consists of wheat, flour, miscellaneous grain, cattle, horses, wool, country produce, farm and mill machinery, and general merchandise. This commerce amounted during the fiscal year to 41,778 short tons, valued at $3,034,315.

This improvement is a factor in regulating freight rates to all points reached by steamers using the canal and locks.

The additional work required to complete the project is not necessary to make the improvement available, but is essential in order to decrease the volumetric capacity of the upper lock, thus shortening the time of lockage, and to eliminate the danger of the water from the upper lock cutting its way around the cut-off wall extending into the bank at the middle gate.

Amount (estimated) required to be appropriated for completion of existing project	$194,260
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	100,000

COLUMBIA RIVER BETWEEN THE FOOT OF THE DALLES RAPIDS AND THE HEAD OF CELILO FALLS, OREG. AND WASH.

Columbia River rises in the southeastern part of British Columbia, flows in a northwesterly direction for about 150 miles, thence in a general southerly direction for about 600 miles until it reaches the northern boundary of Oregon, thence in a general westerly direction for about 350 miles, between the States of Oregon and Washington, until it empties into the Pacific Ocean.

The object of this improvement is to overcome the obstructions in the 12 miles between the foot of Threemile Rapids and the head of

Celilo Falls. There are four principal obstructions—Threemile Rapids, a crooked channel 1,500 feet in length, narrow, and obstructed by rocks and currents; Fivemile Rapids (The Dalles) where for 1½ miles the river rushes with great velocity between precipitous walls of basalt 150 to 300 feet apart; Tenmile Rapids, a similar gorge, but only one-half mile in length; Celilo Falls, with a sheer fall of 20 feet. The total fall is about 81 feet at low water and 60 feet at high stages. It can not be navigated at any stage. The distance of the lower end of the section included in the project from the mouth of the river is about 192 miles.

The amount expended on previous projects prior to the adoption of the present project was $27,112.83.

The existing project, as adopted by Congress in the act approved March 3, 1905, provides for a continuous canal on the Oregon shore, between the pool above Celilo and the pool below Fivemile Rapids, with open-river improvement at Threemile Rapids. It is based on report of a board appointed to revise the preceding project with a view, if possible, of reducing the cost. The report of this board is printed in the Annual Report of the Chief of Engineers for 1904, page 3475 et seq. (No maps.)

The proposed canal was to be about 8½ miles long, 65 feet wide on the bottom, and 8 feet deep; with four locks 250 feet long between quoin posts and 40 feet wide in the clear, with a depth of 7 feet of water over the miter sills. The estimated cost was $4,125,000. The approval of the project by the Chief of Engineers on May 8, 1905, for beginning actual canal construction included increasing the length of the locks to 300 feet between hollow quoins with a clear width of 45 feet. Plans for modifying certain details of the original project were approved by the Chief of Engineers May 15, 1908. These modifications embodied a reduction in curvature of canal axis, the substitution of concrete-lined embankments for heavy masonry walls, and the installation of an extra lock to be located at Tenmile Rapids.

As modified, the existing project includes open-river improvement at Threemile Rapids and a continuous canal on the Oregon shore between the pool above Celilo and the pool below Fivemile Rapids; the canal to have a depth of 8 feet, width of 65 feet at the bottom, and length of 8½ miles, with 5 locks 300 feet by 45 feet (50 feet for Tenmile Lock) by 7 feet over miter sills, two of which will be located at the lower end of the canal, one at Fivemile Rapids, one at Tenmile Rapids, and one at Celilo Falls, at an estimated cost of $4,845,000.

The amount expended on the present project to the end of the fiscal year was $2,392,035.68, of which $31,279.81 was applied to surveying, preparing plans, etc., before its adoption. There has been received on account of sales of blue prints, etc., the total sum of $1,005.93.

Under contract let in 1904 and completed in March, 1908, there was removed 50,970 cubic yards of rock from the rocky ledges in the vicinity of Threemile Rapids, in order to give a channel at least 10 feet deep at low water and from 200 to 250 feet wide.

Investigation made in 1908, based on complaints of steamboat men, developed the fact that further open-river work was needed in the vicinity of Threemile Rapids, and a formal contract was authorized. This contract, made under date of October 14, 1909, was completed March 30, 1912. A total of 13,379.28 cubic yards of rock was removed. The total amount expended on the project at this point is approximately $167,726.25.

Under contract let August 10, 1905, and completed on May 11, 1910, there was constructed about 2,500 feet of the upper end of canal, complete, except lock gates.

Under contract let September 18, 1908, there was completed about 14,000 feet of canal, omitting the concrete lining where canal is in embankment. The contractor completed the requirements of contract on May 1, 1911.

Canal construction work has also been prosecuted by hired labor since July 16, 1910.

It is estimated that on June 30, 1912, the approved project was about 55 per cent completed, but no advantages have been derived from the expenditures, except the benefit furnished by the improvement at Threemile Rapids, where a least channel depth of 10 feet at low water, canal datum, has been obtained. The variation of the water surfaces from extreme low water to extreme high water is about 32 to 90 feet at different points. Boats are now operating between Portland and The Dalles, and between Celilo and Lewiston, 265 miles above Celilo on the Snake River, the cargoes being transported around the obstructions between The Dalles and Celilo by the State Portage Railway, thus furnishing water competition to all intermediate points on the river.

The Columbia River is navigable, in fact, up to the foot of Priest Rapids, about 203 miles above the lower end of the improvement provided for in this project, and the Snake River up to Pittsburg Landing, about 350 miles above the same point.

The Open River Transportation Co. operated two boats during favorable stages between Celilo and Priest Rapids on the Columbia and to Lewiston, Idaho, on the Snake River. They reported handling, during the calendar year 1911, 67,019 short tons of merchandise, farm products, and machinery, valued at approximately $2,586,245.

The influence of this water transportation has resulted in the reduction of freight rates between competitive railroad points up to Celilo, and as the steamboat service on the upper river is increased a still further reduction is anticipated. The benefits to be derived from the improvement when completed, the country which will be affected, and the probable resources to be developed are all described in House Ducument No. 228, Fifty-sixth Congress, second session. The irrigation projects now underway and contemplated should, within a few years, increase the farm products and the resultant traffic to very large quantities.

The Oregon Trunk Railway has constructed a bridge over the Columbia River below Celilo to connect its north bank road (of the Hill system) with its new road, now constructed up the Deschutes River, into central and southern Oregon. The company is now operating this line.

The amount required for expenditure is to be applied to continuing the work of canal construction by hired labor and purchase of materials under existing regulations. No benefits can be derived from this work until the canal is completed and opened to navigation.

The river and harbor act of 1912 directed the Secretary of War to report whether any saving can be effected, and if so, how much, by a more rapid prosecution of this improvement. In House Document

No. 1161, Sixty-second Congress, third session, report is made thereon, from which the following are extracts:

7. The saving, therefore, to be considered is that based on completion with ample funds available and by approximately December 31, 1914, as compared with completion with appropriations about as follows:

March, 1913	$600,000.00
June, 1914	600,000.00
March, 1915, such lesser amount as may be necessary for completion of canal (on basis of estimate for project)	608,392.64

With appropriations made available as above indicated it is probable that the canal could be completed by December 31, 1915, and little, if any, earlier. To have ample funds available for most advantageous prosecution of the work would now require appropriations as follows:

March, 1913	$1,200,000.00
June, 1914, such lesser amount as may be necessary for completion of canal (on basis of estimate for project)	608,392.64

In view of possibility of delay in appropriating the latter amount necessary for the completion and to obtain the best possible results from same it would be even better to increase the 1913 appropriation to $1,400,000 with a view to completion of the project without further appropriations even though this $200,000 in excess of the $1,200,000 would probably not necessarily be used before June, 1914. As already stated this condition of ample funds available would admit of completion of the canal by December 31, 1914.

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13. It is therefore believed that $100,000 is a proper minimum estimate for the saving that can be effected by having appropriations made as indicated in paragraph 7 of this report with a view to the earlier completion of the canal.

Comparative statement of traffic handled by Oregon State Portage Ry. between Big Eddy and Celilo, Oreg.

Calendar year.	Short tons.	Estimated value.
1905	3,058	$185,800
1906	5,414	227,900
1907	4,600	185,000
1908	4,056	207,685
1909	25,482	1,023,165
1910	47,503	1,382,970
1911	67,019	2,586,245

Amount (estimated) required to be appropriated for completion of existing project	$1,808,392.64
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	600,000.00

COLUMBIA RIVER AND TRIBUTARIES ABOVE CELILO FALLS TO THE MOUTH OF THE SNAKE RIVER, OREGON AND WASHINGTON.

Columbia River rises in the southeastern part of British Columbia, flows in a northwesterly direction for about 150 miles, thence in a general southerly direction for about 600 miles until it reaches the northern boundary of Oregon, thence in a general westerly direction for about 350 miles, between the States of Oregon and Washington, until it empties into the Pacific Ocean. This stretch of river is 124 miles long, and can be navigated at favorable stages. It abounds in rapids and shoals, which are obstructed by projecting ledges, isolated bowlders, etc. Before the days of railroads the Columbia River formed the main highway for commerce between the inland empire and tidewater, but navigation was always more or less dangerous, and was practically suspended in 1882, on account of the construction of a line of railroad by the Oregon Railroad & Navigation Co., which practically paralleled the south bank and reached as far as Riparia, on the Snake River, about 72 miles below Lewiston. The lower end of this project is about 200 miles from the mouth of Columbia River.

The first project was adopted by act of June 10, 1872, and in 1877 was modified to include the improvement of the Snake River. This project provided for the improvement of the most troublesome rapids by the removal of obstructing reefs and bowlders, and in this work approximately $120,000 was expended up to the time of the suspension of navigation in 1882.

The existing project is based on the survey authorized by act of March 3, 1905, and was adopted by act of March 2, 1907. It proposes to facilitate navigation by the removal of obstructing bowlders and ledges, and raking the gravel shoals in order to make safe and available the channel that now exists, at an estimated cost of $400,000. In 1907 the State Legislature of Washington appropriated the sum of $25,000 for expenditure in the vicinity of Umatilla Rapids in order to expedite the work under the general project.

The amount expended on the present project to the end of the fiscal year under the national appropriation was $204,805.80, and under the appropriation by the State of Washington, $25,000.

This work is carried on in close connection with Snake River improvement, the plant being used on either work, dependent upon freshet conditions. Steamer *Umatilla*, self-propelling dredge *Wallowa*, and drill scows *Nos. 1, 2,* and *3* were used on this portion of the river.

It is estimated that at the end of the fiscal year the project is about 57 per cent completed.

The work accomplished has resulted in improving the channel through some of the most troublesome shoals, mainly Homly, Umatilla, Devils Bend, Squally Hook, John Day, Canoe Encampment, and Biggs Rapids, giving a least depth of 4½ feet at low water, and has lessened to a considerable extent the dangers that previously existed. During the summer months the river is in freshet, and the extreme variation of the water surfaces at that time is about 34 feet above low water. The head of low-water navigation for boats using this portion of the stream is at Asotin, on the Snake River, 269 miles above Celilo, and approximately 473 miles from the sea. On higher stages boats ascend the Snake River as far as Pittsburgh Landing, a farther distance of about 70 miles. There is no logging on this stretch of river.

During the past year the Open River Transportation Co. has operated its two light-draft steamboats, the *Inland Empire* and the *Twin Cities*. The boats were laid up for a short time during the extreme low water and cold weather in winter, but resumed operations again as soon as conditions were favorable, running between Celilo on the Columbia River and Lewiston on the Snake River, with a branch service between Kennewick and Priest Rapids, on the Columbia River.

The Open River Transportation Co. claims to have made a reduction of 14 per cent on freight rates since beginning operations. The railroads have made similar reduction in their rates to points on the river. These boats report handling 16,411 short tons of general merchandise, farm products, etc., during the calendar year 1911, valued at $671,294.

The amount required for expenditure is to be applied to prosecution of work under the approval project, and is an extension of benefits resulting from removal of obstructing rocks and shoals. The whole amount should therefore be made available.

Comparative statement of traffic carried on Columbia River above Celilo to mouth of Snake River.

Calendar year.	Short tons.	Estimated value.
1907	7,776	....
1908	1,349	....
1909	8,421	$535,840
1910	13,530	562,367
1911	16,411	671,294

Amount (estimated) required to be appropriated for completion of existing project	$115,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	60,000

COLUMBIA RIVER BETWEEN BRIDGEPORT AND KETTLE FALLS, WASH.

The river between the places mentioned is 162 miles long and is navigable for vessels at certain stages of water. The chief obstructions to navigation are rapids, caused at places by immense bowlders and at others by ledges of solid rock.

The original and existing project, adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in Rivers and Harbors Committee Document No. 16, Sixtieth Congress, second session, and contemplates the removal of rocks and bowlders along the shores between high and low water, those exposed at low water and others that are submerged at low water, to a depth of 7 feet, all at an estimated cost of $100,000, which amount is appropriated by the said act, subject to the provision that the State of Washington shall furnish for the execution of the work the plant owned and employed by it on this section of the river.

The estimated quantity of rock to be removed is 64,000 cubic yards at 30 localities.

Report on examination and survey, with map, was published in House Committee Document No. 16, Sixtieth Congress, second session.

Report, without map, on examination of Grand or Rickey Rapids, was published in annual report for 1911, page 2641.

The work during the fiscal year consisted of removal of approximately 1,670 cubic yards of submerged rocks and reefs and of bowlders on shore at seven localities, by the use of Government plant and hired labor, at a cost of $19.89 per cubic yard.

The amount recommended to be appropriated will be applied to removal of obstructions above Box Canyon by hired labor and use of Government plant.

The amount expended during the year was $36,836.46, all for improvement.

The amount expended to June 30, 1912, was $85,334.36, none of which was for maintenance.

The proposed improvement will provide an outlet for traffic from territory not now reached by a railroad and will materially reduce the cost of transportation.

Amount (estimated) required to be appropriated for completion of existing project	$25,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	25,000

SNAKE RIVER, OREG., WASH., AND IDAHO

The Snake River rises near the Yellowstone National Park, in the western part of the State of Wyoming, flows in a general westerly direction for a distance of about 1,300 miles, and empties into Columbia River about 20 miles north of the northern boundary of the State of Oregon.

The portion of the river under improvement extends from its junction with the Columbia to Pittsburg Landing, a distance of about 216 miles. The upper portion runs through a mountainous country and is much obstructed by gravel shoals, ledges of bedrock, bowlders, and numerous rapids. The country through which the river passes, between Riparia and its mouth, is more open, but navigation is difficult, owing to the swift current and numerous rapids. Some of the channels through the rapids are narrow and crooked, and before improvement were practically impassable at low water, owing to the rocky ledges, gravel shoals, and bowlders. The Snake and Columbia Rivers in early days formed the natural highway for the traffic between the inland empire and the Pacific coast, and navigation on the Snake River, notwithstanding the difficulties, continued until the completion of the railroad to Riparia, in 1882, after which boats abandoned the river below that point.

In 1877 a project was approved for removing reefs and bowlders and for scraping gravel bars in the Columbia and Snake Rivers between Celilo, Oreg., and Lewiston, Idaho, a distance of 263 miles, at an estimated cost of $132,000. Since 1882 operations on the Snake River have been confined to the stretch above Riparia. In 1892 the project was extended to include the improvement of the 7 miles of river between Lewiston, Idaho, and Asotin, Wash., and the act of June 13, 1902, further provided for extending the improvement to Pittsburg Landing. The project now provides for completing and maintaining the improvement between Lewiston and Riparia, with a view to obtaining a low-water depth of 5 feet, by means of blasting, dredging, raking, and by contraction works, and for general improvement up to Pittsburg Landing. The work between Riparia and

Pittsburg Landing is based on surveys made in 1900, 1902, and 1905, between Riparia and Lewiston, between Lewiston and Imnaha River, and between Imnaha River and Pittsburg Landing, at an estimated cost of $23,000, $33,690, and $15,000, respectively.

In 1907 the Washington State Legislature appropriated $100,000 for expenditure between Riparia and the mouth, but of this sum only $85,000 was used, the final requisition for $15,000 not being honored by the State auditor for the reason that it had lapsed on April 30, 1909, prior to the requisition. This appropriation was made as the result of a general disposition to revive navigation below Riparia and utilize the State Portage Road, which was built in 1905, around the obstructions in the Columbia between Celilo and Big Eddy. The project for this portion of the river, which was formulated for the especial purpose of expending the above-mentioned appropriation, is based on the survey made in 1897, and is a continuation of general open-river work.

The amount expended on the original and modified projects to the close of the fiscal year was $314,510.34 under the national appropriation and $85,000 under appropriation made by the State of Washington.

The work done resulted in improving the conditions and in making a safer and more navigable channel between Riparia and the mouth of the river. It is estimated that the project is about two-thirds completed.

The maximum draft that could be carried June 30, 1912, over the shoalest point between the mouth and Riparia was 28 inches; between Riparia and Asotin, 40 inches; and between Asotin and Pittsburg Landing, 24 inches.

The Snake River is in freshet during the summer months from melting snow in the mountains, and during these freshets the variation of the water levels is usually about 20 feet. The head of navigation during proper stages is at Pittsburg Landing, about 216 miles above the mouth, but only intermittent trips are made to that point, regular traffic being carried on only as far up as Lewiston. There is no logging or rafting on the Snake River, but logs are floated down the Clearwater River to the mills near Lewiston.

The Open River Transportation Co., a corporation organized for the purpose of navigating the river, is now operating a line of boats between Portland, Oreg., and The Dalles, and have two powerful light-draft boats, the *Inland Empire* and the *Twin Cities*, for use on the upper river. These latter boats run between Lewiston and Celilo, and exchange cargoes with the lower-river boats by means of the State Portage Road between Celilo and The Dalles.

The Oregon-Washington Railroad & Navigation Co. has operated its two steamboats, the *Lewiston* and *Spokane*, during favorable stages between Riparia and Asotin, calling at points on the opposite bank from the railroad.

The Spokane, Portland & Seattle Railway Co. has completed a line from the mouth of Snake River to Riparia, on the north bank of the river, and has traffic arrangements with the line between Riparia and Lewiston.

Since operation of the Open River Transportation Co.'s boats a reduction of about 14 per cent in freight rates has been made, which reduction has been met by rail lines.

The commerce transported on the Snake River during the calendar year amounted to 30,723 short tons, and consisted principally of farm and mill machinery, grain, fruit, and general merchandise, valued at approximately $1,020,109.

The amount required for expenditure for the next fiscal year will be applied to the removal of obstructions, for maintenance, and improvement, and the proposed work is essential in order to make the improvement available.

Comparative statement of traffic carried on Snake River.

Calendar year.	Short tons.	Estimated value.	Calendar year.	Short tons.	Estimated value.
1902	37,824		1907	39,228	
1903	44,379		1908	46,325	
1904	43,547	$1,789,677	1909	35,245	$1,026,036
1905	28,380	1,191,960	1910	28,073	887,365
1906	71,556	2,671,882	1911	30,723	1,020,109

Amount that can be profitably expended in fiscal year ending June 30 1914, for works of improvement and for maintenance $25,000

GRAYS HARBOR AND CHEHALIS RIVER, WASH.

Grays Harbor is situated in the southwest part of the State of Washington, 48 miles north of the mouth of the Columbia River. It has a total length from east to west of 17 miles and its greatest breadth from north to south is 14 miles. There are two main channels traversing the inner or eastern part of Grays Harbor from east to west—the north and south channels. There was also formerly a middle channel connecting the north and south channels. The south channel is shoal and is but little used. The north channel is used by all ocean-going vessels entering the harbor. There are two shoals in the north channel, one about 2½ miles below Hoquiam and one between Hoquiam and Aberdeen. The ruling depth over these shoals was originally 8 feet at mean low water. The channel widths were ample.

The Chehalis River has its source in the southwestern part of the State of Washington, about 110 miles east of the Pacific Ocean, flows in a westerly course for 93 miles and empties into the eastern extremity of Grays Harbor.

The section covered by the existing project is about 15 miles in length and includes the mouth of the river.

From the mouth to Montesano, 15 miles, there is about 13 feet of water at high tide. From Montesano to Elma, 16 miles, there is generally sufficient water for light-draft boats. There is practically no navigation above Elma and no regular boats go above Montesano. The river is used extensively for floating saw logs.

The original project for the inner harbor, adopted by Congress July 13, 1892, provided for the construction of piles, brush and stone dikes to partly close up the south and middle channels and concentrate the flow of water in the north channel, thereby increasing the depth of water by scour. The shoals above and below Hoquiam were to be dredged to a depth of 16 feet at half tide.

The amount expended prior to operations under existing project was $93,999.06.

The original project for Chehalis River, adopted by Congress August 2, 1882, contemplated the removal of snags and other obstructions which may accumulate in the portion of the river regularly used by boats. The estimated cost was $50,000. The amount expended on the original project was $19,000.

The existing project, adopted by the river and harbor act of March 2, 1907, provides for a channel 200 feet wide and 18 feet deep at mean lower low water from Cosmopolis to deep water below Hoquiam, and removing snags from the Chehalis River, at an estimated cost of $187,500, in accordance with House Document No. 507, Fifty-ninth Congress, first session.

The funds provided by this act were insufficient to secure the project channel dimensions, but these dimensions were obtained with funds provided by the act of March 3, 1909, and use of the Government dredge *Oregon*.

Subsequently a shoal formed in the channel below Hoquiam over which the depth was 13 feet at mean lower low water. This shoal was removed in 1911, but at the close of the fiscal year the channel below Hoquiam had again shoaled to 16 feet and near Aberdeen to 13 feet at mean lower low water.

The amount expended during the fiscal year was $15,979.64, all for maintenance.

To June 30, 1912, $310,746.64 had been expended under the above projects, of which $43,584.52 was applied for maintenance and for surveys. The sum of $30.05 was received from sales.

To provide for maintenance of project channel depths by dredging, the sum of $30,000 will be required for the fiscal year ending June 30, 1914.

The project for the Chehalis River, adopted by the river and harbor act of June 25, 1910, contemplates providing a channel 6 feet deep at low water from Cosmopolis to Montesano and the construction of dikes to concentrate the current over certain shoals, in accordance with plan printed in House Document No. 1125, Sixtieth Congress, second session. The estimated cost of the proposed work is $50,000, the said act making an appropriation of $32,500, and $10,000 additional was appropriated by the act of February 27, 1911.

There has been no modification of the existing project.

The channel between Cosmopolis and Montesano was dredged to project dimensions by the Government dredge *Oregon* during 1910, but the channel depths have deteriorated and the controlling depth is now 4 feet at mean lower low water.

No work was done on the Chehalis River during the year.

The maximum draft that could be carried June 30, 1912, over the shoals below Aberdeen at mean lower low water was 13 feet.

The maximum draft that could be carried June 30, 1912, at mean low water at Montesano was about 4 feet.

The tidal variation is 8½ feet in the inner harbor and 7 feet in the Chehalis River.

The commerce benefited by this improvement consists very largely of floating and towing logs and carrying lumber in sailing vessels and steam schooners.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1898	2,730	$293,610	1905[1]	730,108	$3,929,030
1899	2,232	352,316	1906[1]	842,423	5,854,891
1900	4,376	132,157	1907[1]	832,914	7,070,161
1901	5,706	200,264	1908[1]	862,809	6,249,424
1902	3,529	157,552	1909[1]	666,081	6,619,052
1903	4,972	139,150	1910	784,772	4,602,520
1904[1]	548,575	2,601,623	1911	1,283,096	4,967,797

[1] Differs from former report due to addition of log traffic.

No definite information of reduction of freight rates on account of the improvement has been received.

The funds recommended for appropriation will be applied to restoration of channel depths necessary to make the improvement available.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement.. $30,000

COWLITZ AND LEWIS RIVERS, WASH.

(*a*) *Cowlitz River.*—The Cowlitz River rises in the Cascade Range, flows southerly for about 60 miles, then westerly for 40 miles, and empties into the Columbia River 64 miles above its mouth and about 45 miles below Portland. Prior to improvement the ruling depth to Toledo, about 40 miles above the mouth, was about 14 inches at low water, and the channel was crooked, narrow at many places, and obstructed by sand and gravel bars, snags, and drift.

The original project was adopted by the act of June 14, 1880, and provided for the removal of sand bars and other obstructions to a point about 50 miles above the mouth, at a cost of $5,000 and an annual expenditure thereafter of $2,000 for maintenance.

The sum of $53,182.93 was expended on the original project, of which $48,183.93 was applied to maintenance.

The present project for improvement from the mouth to Toledo, adopted by the river and harbor act of June 25, 1910, provides for obtaining a channel 4 feet deep from the mouth to Ostrander and 2½ feet thence to Castlerock, by dredging. Estimated cost, $22,000, with $4,000 annually for maintenance. Also between Castlerock and Toledo the project contemplates a channel 40 feet wide and 2½ feet deep at low water, by dredging, snagging, and the construction of a limited number of regulating works to assist in maintaining the channel. Estimated cost, $9,600, with $2,000 annually for maintenance, all in accordance with reports printed in House Documents Nos. 1167, Sixtieth Congress, second session, with maps, and 404, Sixty-first Congress, second session, without maps.

The expenditures on the existing project to the close of the fiscal year amounted to $23,174.43, of which $1,640 has been applied to maintenance.

It is estimated that 60 per cent of the project has been accomplished and has resulted in securing a channel of 4 feet at mean low water over the 9 miles between the mouth and Ostrander and in dredging two bars near Toledo in the upper stretch to a depth of 2½ feet at low water. The work has greatly facilitated the passage of boats to Ostrander, above which point sufficient work has not yet been done to affect the conditions.

The maximum draft that can be carried over the shoalest places at the close of the year is approximately 14 to 16 inches at low water.

The usual variations of the level of water surfaces, due to tide, range from 4 feet at the mouth to zero 9 miles up the stream. The extreme variation on account of freshets is about 22 feet, except at the mouth, where the country is open, allowing the water to spread over a large area.

The river has previously been improved to Toledo, about 40 miles. Under the present project a tidal section 9 miles in length from the mouth to Ostrander has been dredged to the projected depth of 4 feet at low water.

The head of navigation for light-draft boats on the higher stages is 10 miles above Toledo, or about 50 miles from the mouth. Large quantities of logs are annually floated down the river from the headwaters for a distance of 25 to 90 miles.

Kelso, 4½ miles from the mouth, and having a population of about 1,500 people, is the principal town of the valley, and is the center of a large lumber and shingle industry. Kelso and Castlerock, another small town about 20 miles from the mouth, are both on the main line of the Northern Pacific Railway, and while some lumber products are shipped by rail, the farm products are usually handled by the river boats and marketed at Portland. The river is therefore a great factor in regulating freight rates from these points to competing points on the river. The traffic consists of lumber, farm products, and general merchandise, of which 73,659 short tons were handled during the calendar year 1911, valued at $1,592,646.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Passengers.	Calendar years.	Short tons.	Estimated value.	Passengers.
1901	14,211			1907	66,424	$3,390,000	759
1902	15,932			1908	53,309	1,934,982	
1903	41,515			1909	41,063	1,641,240	14,100
1904	26,120	$1,069,020	6,875	1910	75,667	2,106,585	9,500
1905	46,646	1,494,260	6,000	1911	73,659	1,592,646	10,000
1906	56,109	2,055,460	1,117				

This statement does not include 109,980,812 feet b. m. (219,961 tons) of logs brought down this stream in 1911, having an estimated value of $714,870.

On the amount recommended for expenditure during the fiscal year 1914, $7,500 is required to complete the project on account of the cost of repairs and alterations of the old United States dredge employed on the work, and of raising and repairing dredge after she had sunk. The balance, $6,000, is for maintaining the channel and removing obstructions which are brought down during freshet periods.

The river and harbor act of July 25, 1912, made provision for the construction of a combined dredge and snag boat, estimated to cost $55,000, which amount is provided by the act, for use in connection with the improvement of the Cowlitz, Lewis, and Clatskanie Rivers, in accordance with recommendation printed in House Document No. 28, Sixty-second Congress, first session.

(*b*) *Lewis River.*—The Lewis River rises in the Cascade Range, flows in a westerly direction, and empties into the Columbia River about 14 miles below the mouth of the Willamette and 26 miles below Portland. At a distance of about 3¾ miles from the mouth, the river separates into two branches, the North Fork, about 85 miles, and the East Fork, about 36 miles in length.

Originally the channels were obstructed by snags, overhanging trees, and occasional shoals, but were navigable for small, light-draft boats at proper stages to La Center on the East Fork and Woodland on the North Fork.

Over the shoals the channels are narrow, but are of sufficient depth and capacity, at normal stages, to allow of daily steamboat service between Portland and Lewis River points. The improvement covers about 7 miles from the mouth to La Center on the East Fork, and about 26¾ miles of the North Fork to Hayes.

The original project was adopted by the river and harbor act of March 3, 1899, and is based on report of survey printed in the Annual Report of the Chief of Engineers for 1897, page 3473, and as House Document No. 64, Fifty-fifth Congress, first session, without maps. The estimated cost of the improvement, which did not include the North Fork, was $20,460. It provided for removal of snags and obstructions, dike construction, and dredging with a view to securing a depth of 6 feet in the main river to the forks and 4 feet to La Center.

The present project is the same as the original one, except that the improvement of the North Fork was included in the river and harbor act of June 13, 1902, for which no estimate of cost had previously been made.

There has been expended on the original and modified project to the close of the fiscal year the sum of $27,705.34, of which approximately $5,453.72 has been applied to maintenance.

It may be stated that the original project has been entirely completed, and has resulted in facilitating to some extent the use of the river by steamboats. The maximum draft that can be carried at normal stages to the forks is about 4 feet, on the East Fork to La Center about 2½ feet, and on the North Fork to the head of navigation about 1 foot.

The variation of the water surfaces, due to tides, is from 2 feet at the mouth to 1½ feet at La Center, while at Woodland the tide has no effect. The winter freshets vary from 15 to 20 feet in height, except near the mouth, where the water spreads out over a large area, and the conditions are such that regular boats from Portland reach La Center during about three months of each year and Woodland about nine months.

The length of the improved sections and length in miles of the navigable portion are the same, viz:

		Miles
Mouth to the forks	tidal	3¾
East Fork to La Center	do	3
North Fork to Woodland	do	3½
North Fork, Woodland to Runyon	nontidal	23

The head of navigation on the North Fork has heretofore been considered at Woodland, but at the present time a small boat is making daily trips to Runyon, about 23 miles above Woodland.

Logs are floated down this stream for a distance of 20 to 45 miles above the mouth.

The commerce consists principally of lumber, farm products, and general supplies, and during the calendar year 1911 amounted to 16,507 short tons, valued at approximately $1,092,290. This does not include large quantities of logs floated downstream.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Passengers.	Calendar years.	Short tons.	Estimated value.	Passengers.
1901	17,277		15,532	1907	20,140	$1,179,117	13,869
1902	13,831		13,098	1908	17,771	1,112,840	13,880
1903	29,033		13,058	1909	19,384	1,144,320	14,000
1904	27,245	$834,492	12,885	1910	51,365	1,352,145	6,450
1905	26,554	1,067,733	29,026	1911	16,507	1,092,290	8,499
1906	19,024	960,120	16,614				

NOTE.—This statement does not include 19,431,041 feet b. m. (38,862 tons) of logs brought down this stream in 1911, having an estimated value of $126,300.

Regarding the decline in tonnage carried on the Lewis River during the calendar year 1911, it is stated by the transportation agents that the actual amount of freight handled during 1911, in and out of the territory tributary to the river, did not materially differ from the preceding year, but owing to the uncertainty of river transportation on account of the condition of the channel larger quantities of freight were diverted from the river and hauled by team at great expense to and from distant rail points; also that the shutting down of the logging camps and lumber mills along the river had a tendency to decrease the tonnage.

The Northern Pacific Railway, between Portland and Puget Sound, crosses the river at Woodland, but the river carries the greater part of the commerce from the valley, owing to the cheaper rates of transportation and the better facilities for handling traffic by water.

A large amount of sediment and numerous snags are brought down by the freshets, which necessitates additional work each year to maintain the channel and make it available for boats of light draft.

The amount estimated as a profitable expenditure in fiscal year ending June 30, 1914, is to be applied to operating the combined dredge and snagboat for improving the river in accordance with the new project adopted by the river and harbor act of July 25, 1912.

Consolidated.

Amount (estimated) required to be appropriated for completion of existing project	$7,500
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	23,500

Following is the letter of the Acting Chief of Engineers submitting report on a recent survey of Lewis River, printed in House Document No. 28, sixty-second Congress, first session:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, April 22, 1911.

SIR: I have the honor to submit herewith, for transmission to Congress, reports dated February 2 and September 8, 1910, by Maj. J. F. McIndoe, Corps of Engineers, on preliminary examination, with plan and estimate of cost of improvement, called for by the river and harbor act approved March 3, 1909, of Lewis River, Wash., including the North Fork and the East Fork to La Center.

The existing project for this river, adopted in 1897 and extended in 1902, is to obtain by dredging, dike construction, and removal of snags and other obstructions a channel 6 feet deep at low water in the main river up to the forks, 4 feet deep at low water to La Center on the East Fork, and to similarly improve the North Fork; but no depth nor estimate of cost for the North Fork was specified. Five wing and closing dams have been built and a navigable channel has been maintained by dredging and snagging, although the project depth has not yet been secured.

The district officer submits a revised plan and estimate for work of dredging, snagging, removing obstructions, building wing and closing dams, and revetment of bank, which is to provide channels as follows: From mouth 6 feet deep, 50 feet wide, to the Forks; East Fork, 4 feet deep, 50 feet wide, to La Center; North Fork, 4 feet deep, 50 feet wide, to Woodland, and 2½ feet deep, 40 feet wide, to Runyon. The estimated cost is $61,500, with $6,000 annually for maintenance after completion. The recommendation for the work in North Fork to Woodland is made contingent upon the provision by local interests of a public dock and warehouse at Woodland. The division engineer concurs in the recommendations of the district officer.

These reports have had consideration, as required by law, by the Board of Engineers for Rivers and Harbors, and the board concurs in the foregoing recommendations, except that the adoption of a definite project depth in North Fork above Woodland is not recommended, it being considered that although this part is worthy of improvement to the amount estimated it is doubtful that the proposed depth of 2½ feet can be secured at a reasonable cost.

I concur in the views and recommendation of the Board of Engineers for Rivers and Harbors, that Lewis River, Wash., including the North Fork up to Runyon and the East Fork up to La Center, is worthy of improvement by the General Government in the manner proposed, at an estimated cost of $61,500, and $6,000 annually for maintenance after completion.

Attention is invited to the recommendation of the district officer that a combined dredge and snag boat be built for maintenance work on the Lewis, Cowlitz, and Clatskanie Rivers.

Projects contemplating a considerable amount of original and maintenance dredging were adopted by the river and harbor act of June 25, 1910, for the last two rivers, and there is no United States or privately owned plant available in the vicinity. I concur in the opinion of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors that the total cost of the work of improvement of these three rivers would probably be reduced by the use of a suitable Government dredging plant as recommended, and that its construction is advisable before work of improvement of Lewis River herein recommended is undertaken. The estimated cost of a suitable combination dredge and snag boat is $55,000.

Very respectfully,

Edw. Burr,
Acting Chief of Engineers.

The Secretary of War

GRAYS RIVER, WASH.

Grays River rises in the Coast Range, flows southwesterly for a distance of about 30 miles, and empties into that part of the estuary of the Columbia River known as Grays Bay, nearly opposite the town of Astoria. It passes through dense forests until it reaches the lowlands bordering the Columbia River. The lower 8 miles is covered by the improvement, and this portion has been navigated for years with difficulty, owing to the narrow, tortuous channel and to snags, logs, and overhanging trees.

The original and present project was adopted by the act of March 2, 1907, which appropriated $2,500 for the purpose of removing the obstructions from the channel and cutting the overhanging trees from the banks. The project for this work was based on a report of the Board of Engineers for Rivers and Harbors dated October 15, 1906, by which it was proposed to carry the improvement to the head of navigation.

The total amount expended on this work to the close of the fiscal year 1912 was $2,952.27, of which amount $452.27 has been applied to maintenance.

The project has been completed, and except for maintenance no further work is contemplated.

The work done in former years, which consisted in the removal of snags and scraping some of the shoals, has provided a safer and easier channel and has rendered the river navigable at a stage of water at least 6 inches less than was possible prior to improvement.

The maximum draft that can be carried to Grays River, a small town 8 miles above the mouth, is about 3 feet at low water. The variation of water surfaces due to tides is from 5 to 8 feet.

The improved section, also the navigable portion of Grays River, is tidal and is 8 miles in length. It extends from the mouth to the town of Grays River, which is the head of tide and of navigation.

This stream is used extensively for logging purposes, logs being floated from the headwaters a distance of about 10 miles.

The commerce consists principally of logs towed from the lower portion of the stream to the mills along the Columbia and some farm products and supplies handled by a small boat plying from Astoria.

Comparative statement of traffic.

Calendar years.	Short tons.	Estimated value.	Passengers.
1908	1,876	$35,628	....
1909	3,395	51,325	5,000
1910	7,949	161,198	5,000
1911	2,485	68,539	6,000

NOTE.—This statement does not include 66,600,000 feet b. m. (133,200 tons) of logs brought down this stream in 1911, having an estimated value of $432,900.

The river is the only means of transportation and, aside from furnishing easier navigation for the light-draft boats using the channel, it is not believed the improvement will have any tendency to reduce the present rates of transportation.

The winter freshets usually bring down snags and logs, and the available balance will be applied to the purpose of removing them as may be necessary.

The amount estimated as a profitable expenditure in fiscal year 1914 will be applied to the removal of obstructions, necessary to make the improvement available.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$500

SKAGIT RIVER, WASH.

The Skagit River is the largest river in western Washington tributary to Puget Sound. The survey on which the present project was based covered that part of the river from Sedro-Wooley to its mouth, a distance of about 28 miles. For about 18 miles below Sedro the river flows in one channel; it then divides into two branches, the North Fork and the South Fork. Each of the two main forks subdivides into several smaller branches that find their way across the flats into Skagit Bay.

The Skagit River is navigable for light-draft boats at all stages of water from the bar at its mouth to Mount Vernon, 11 miles, and at all stages, except extreme low water, to Avon, 3 miles above Mount Vernon. During ordinary high waters the river is navigable as far as Sauk River, 68 miles from its mouth.

Navigation between the deep water in the river and deep water in Saratoga Passage was impracticable except on tides, due to a bar about 3 miles wide, over which the depths vary from 1 foot to 3 feet on low tide. The tidal variation at the mouth of the river is 12 feet.

The Skagit River has been improved to the extent of removing snags and similar obstructions to navigation since 1882, under appropriations for the operation of a snagboat on Puget Sound and tributary waters.

The existing project, adopted by the river and harbor act of June 25, 1910, in accordance with plan printed in House Document No. 1188, Sixtieth Congress, second session, contemplates the construction of a training dike from the mouth of the South Fork of the Skagit River across the flats to deep water in Saratoga Passage, regulating dikes and mattress sill near the head of the North Fork, and closing subsidiary channels at the delta of the river. The estimated cost of the work is $100,000, which amount has been appropriated.

The mattress sill and closing dikes in the river and the training dike, 10,450 feet long, at the mouth of the river have been completed. Seven hundred feet of the training dike were built during the fiscal year.

The amount expended during the year was $46,331.25, of which $147.20 was for maintenance.

The amount expended to June 30, 1912, was $99,977, of which $147.20 was for maintenance.

Exports and imports.

Calendar year.	Short tons.	Value.
1909	140,839	$2,781,602
1910	210,564	3,718,878

NOTE.—Freight statistics previous to 1909 included in Puget Sound and tributary waters, Washington.

The proposed improvement will probably not have any effect on freight rates, as the influence of water competition is already felt; but if successful it will insure a continuance of existing conditions.

The appropriation recommended is for maintenance, and will be applied to repair and restoration of dikes, which experience has shown to be necessary.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$25,000

PUGET SOUND AND ITS TRIBUTARY WATERS, WASH.

Most of the channels of Puget Sound proper have ample depths for purposes of navigation, but the extensive lumber and fishing industries in these waters render it very important to maintain a general supervision over the navigable channels, to regulate the construction of fish traps, log booms, and other structures incident to these important industries, and to prevent obstructions which are detrimental to general navigation. A number of streams and rivers tributary to Puget Sound are of great value to boat navigation, but they are all liable to be obstructed by the débris generally found in streams flowing through a heavily wooded country.

All these streams are used to a greater or less extent for floating logs and shingle bolts, and the towing of log rafts and timber products constitutes the main part of the commerce. The distance upstream to which boats run is extremely variable, depending on the stage of water and tide. Steamboat navigation on the Skagit extends as far up as the mouth of the Sauk, but boats do not often ascend above Hamilton or Birdsview.

On the Stilaguamish boats do not go above Florence, 6 miles from the mouth. The Snohomish is navigable for river boats to the Forks, 22 miles, and the lower portion of one of its tributaries, the Skykomish, is navigable at high stages. The Snoqualmie River is navigable at a low-water stage for a distance of 30 miles from the Forks, and at high stages for an additional distance of 20 miles. On the Duwamish small boats go as far as the junction of the White and Black Rivers, about 16 miles from the mouth. Under favorable conditions they can go several miles up the White, and occasionally boats pass up the Black into Lake Washington. On all these streams the distances to which steamboat navigation actually extends are generally less, and the distances over which towing and floating of logs extend are greater than the distances above named. None of these streams is closed in winter by ice. All are affected by the tidal variation in Puget Sound, which is large and extremely irregular.

The work of improvement consists in the maintenance of the navigable channels by snagging and removing obstructions.

Formerly works of improvement were carried on under specific appropriations, but since the act of July 13, 1892, appropriations have been made in the present general and comprehensive form except in cases of large local works. This method operates greatly to the advantage and economy of the work.

There is a considerable amount of miscellaneous work in the district that is paid from this appropriation, such as investigation of harbor lines, bridges, obstructions, occasional surveys, gauge readings, etc.

The amount expended to June 30, 1912, was $406,560.72, of which $13,619.36 was expended in construction and repair of dikes and mattress sills.

The act of March 2, 1907, provided for the removal of the rock in the entrance to Roche Harbor at a cost not to exceed $30,000. The work was begun October 1, 1907, under contract, and completed April 17, 1908.

The water traffic on Puget Sound and its tributary waters is very large and rapidly growing. It includes vessels of about every type and size in use throughout the world, but it is quite impracticable to give in the form of concise statistics a condensed statement of the amount and value of the commerce more or less directly benefited by work under this appropriation. Statistics have been compiled only for the tributary streams on which the snag boat has mostly worked.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1898	12,676	$539,406	1905	86,412	$1,817,048
1899	13,500	577,586	1906	167,197	1,898,657
1900	35,066	1,324,926	1907	124,336	3,011,146
1901	30,155	1,499,420	1908	44,922	1,659,930
1902	61,794	2,324,980	1909	143,770	1,250,694
1903	94,274	3,193,458	1910	188,447	1,427,760
1904	92,465	1,790,828			

No definite information relative to effect of the work on freight rates is available.

The appropriation recommended will be applied to the operation of the Government plant in the maintenance of navigable channels and the removal of obstructions to navigation.

The river and harbor act of July 25, 1912, made an appropriation of $25,000 for continuing improvement and for maintenance, including Stilaguamish River, in accordance with report printed in House Document No. 19, Sixty-second Congress, first session, which contemplates restoring and maintaining former widths and depths in the main channel and in the other two outlets, South Pass and West Pass; the effect of the closure of Hat Slough to be observed for some time before other measures to bring about the desired results are undertaken.

Amount that can be profitably expended in fiscal year ending June 30, 1914, for maintenance of improvement	$25,000

CANAL BETWEEN PORT TOWNSEND BAY AND OAK HARBOR, WASH.

Port Townsend Bay and Oak Bay are arms of Admiralty Inlet, the former extending from near the north end of the inlet, 8 miles to the southward, and the latter from near the south end of the inlet 3 miles northwestward to a gravel spit 150 yards wide. This gravel spit is about one quarter of a mile long and with the shoals on either side of it forms the barrier which separates these two bays.

The following report of the Board of Engineers, in which the Chief of Engineers concurs generally, is printed in House Document No. 625, Sixty-second Congress, second session:

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, January 15, 1912.

Respectfully returned to the Chief of Engineers, United States Army.

It developed from the survey for a ship canal between Port Townsend Bay, Puget Sound, and Oak Harbor (Oak Bay), Wash., that the ridge separating these bays is composed of sand, gravel, and some mud easily dredgeable, and that the difference in elevation of the water surface at any time in these bays is only slightly more than 1 foot. The district officer states that this difference is not believed to be sufficient to cause velocities that would either seriously erode the banks or unduly interfere with navigation, and that such a cut would not injuriously affect the present excellent harbor in Port Townsend Bay.

He states that the tidal currents between Admiralty Head and Marrowstone Point, while swift and sometimes dangerous to small craft, do not form any barrier to ocean-going vessels, and that vessels of this class would not make use of a ship canal if it were provided. He believes that a canal 15 feet in depth and 75 feet bottom width would accommodate the Puget Sound commerce between Seattle and Tacoma and the industries at the head of Port Townsend Bay, as well as the log tows which traverse Admiralty Inlet in both directions, and that such a canal, if built, would be habitually used by the steamer running between Seattle and Irondale, by tug boats and barges bringing raw materials to the industries at the head of Port Townsend Bay, and by similar craft in carrying away the products of these industries. Log tows would also make use of the canal when wind and tidal conditions were unfavorable around Marrowstone Point.

No definite estimate of the amount of commerce that would use the canal could be made, but from analysis of all the information in hand it appears that it would be large. The plan proposed contemplates the use of two small jetties at the southern end, a bulkhead to retain the dredged material, and the excavation of a canal 15 feet deep and 75 feet wide on the bottom at a total estimated cost of $62,500. He states that the item of maintenance is uncertain, but that it should not be large, and would be limited to occasional dredging until equilibrium is established. He believes the project is worthy of being undertaken, provided the right of way and land necessary for deposit of dredged material are furnished free of cost to the United States. In this view the division engineer concurs.

From all the facts it appears that the benefits of such a canal will be large and the cost comparatively small. The board is therefore of the opinion that it is advisable for the United States to undertake the project under the conditions given above, and recommends that the whole amount be made available in one appropriation. There are no questions of terminal facilities or other subjects which could be so coordinated with the project proposed as to lessen the cost and compensate the Government for expenditures made in the interets of navigation.

For the board:

WM. T. ROSSELL,
Colonel Corps of Engineers
Senior Member of the Board.

WATERWAY CONNECTING PUGET SOUND WITH LAKES UNION AND WASHINGTON, WASH.

Lakes Union and Washington are bodies of fresh water near Puget Sound, in the immediate vicinity of the city of Seattle. Lake Union is entirely within the city limits. The proposed improvement originally contemplated a ship canal connecting both lakes with the sound. There is no navigable connection at present with Lake Union, but Lake Washington, through the Black and Duwamish Rivers, has a navigable connection of limited depth with Puget Sound.

A succinct history of the project and references to reports, etc., may be found on pages 791 to 793 of the Annual Report of the Chief of Engineers for 1907.

The work done under the project adopted by the act of August 18, 1894, consisted of dredging a channel from the Sound to the wharves at Ballard, in Salmon Bay, and the excavation of a cut between Lake Union and Salmon Bay for the control of the water level in Lake Union. The work was done under the river and harbor acts of June 3, 1896, and March 3, 1905. It has resulted in a channel 50 feet wide and 16 feet deep at extreme low water from Puget Sound to a point 2,000 feet west of the lock site. From this point to the lock site the channel is 75 feet wide and 16 feet deep. From the lock site to the railroad trestles at the eastern part of Ballard Harbor the channel is 75 feet wide and 10 feet deep at extreme low water, excepting the temporary channel around the lock site, which is 6 feet deep at extreme low water. A turning basin, ranging from 175 to 500 feet in width, has been dredged at Ballard.

The amount expended for this work and maintenance of outlet gates at Lakes Union and Washington and improving the drainage of Lake Washington was $475,002.45.

The present commerce benefited by the improvement of the channel to Ballard is the towing of logs to the mills at Ballard and the export of lumber and shingles from that place. Logs are brought in in rafts and lumber is loaded on scows at the mills and then towed to the open Sound.

It has not been practicable to determine what effect the improvement work has had upon freight rates.

The river and harbor act of June 25, 1910, made provision for continuing the improvement of this waterway by adopting the plan presented in House Document No. 953, Sixtieth Congress, first session, which contemplates the construction of a double lock, the said lock to be located at The Narrows, at the entrance to Salmon Bay, and an unbroken channelway through Salmon Bay and Lake Union to Lake Washington, the difference in the level of the two lakes to be overcome by lowering the surface of the latter to the plane of the former, at an estimated cost of $3,554,932, the work to be done by the Government being the construction of the double lock and necessary accessory works, which is estimated to cost $2,500,000. The said act made an appropriation of $150,000 and a continuing-contract authorization in the sum of $2,125,000 additional for this work, subject to the following provision—

> That before beginning said work or making such contract or contracts the Secretary of War shall be satisfied that King County or some other local agency will do the excavation in the waterway above the lock to the dimensions recommended in said project

and will also secure the United States from liability for any claims or damages on account of the grant made to James A. Moore or his assigns by the act of Congress approved June eleventh, nineteen hundred and six, or on account of the lowering of the level of Lake Washington, raising the level of Salmon Bay, or any other alteration of the level of any part of said waterway.

There has been no modification of the existing project.

On June 30, 1911, the Secretary of War expressed himself as satisfied that King County or some other local agency will do the necessary excavation above the lock, etc., and he authorized the beginning of work under the project adopted by the act of June 25, 1910.

The amount expended to June 30, 1912, under the existing project adopted by the act of June 25, 1910, was $164,467.09, of which $5,078.91 was for maintenance of outlet gates at Lakes Union and Washington.

The sum of $128.15 was received from sales.

The maximum draft that could be carried to the wharves at Ballard June 30, 1912, at extreme low water, was 6 feet. The maximum tidal variation is about 18 feet.

Exports and imports.

Calendar year.	Short tons.	Value.	Calendar year.	Short tons.	Value.
1901	410,565	$2,002,950	1907	797,228	$5,520,518
1902	428,073	2,432,401	1908	530,352	3,098,954
1903	524,500	2,219,000	1909	616,318	3,044,231
1904	584,079	2,520,785	1910	515,983	3,364,693
1905	888,161	4,588,198	1911	598,157	2,628,439
1906	705,841	3,993,410			

NOTE.—The above includes only the present commerce of Ballard and Salmon Bay, Lake Union, and Lake Washington.

The appropriations recommended will be applied to the purchase of materials and the construction of the locks and dam.

The existing project involves the construction of a canal from Puget Sound through Salmon Bay and Lake Union to Lake Washington. In adopting this project the river and harbor act of June 25, 1910, authorized the construction by the United States of a lock at The Narrows, at the entrance to Salmon Bay, upon condition that the excavation in the waterway above the lock to Lake Washington should be made by local interests, but no provision was made for the necessary excavation in that part of the waterway below the lock to Puget Sound. The estimated cost of the latter work is $355,000.

In order that this part of the work may be ready by the time the rest of the canal shall be completed, it is believed that provision for dredging the canal below the lock should be made at the next session of Congress. The work, when undertaken, can be prosecuted most advantageously under a single appropriation of the whole amount of $355,000, or with a cash appropriation of a part of this sum and a continuing-contract authorization for the remainder.

Amount of continuing-contract authorization, act of June 25, 1910	$2,125,000
Amount appropriated under such authorization	650,000
Amount yet to be appropriated	1,475,000

Amount (estimated) required to be appropriated for completion of existing project	$1,475,000
Amount that can be profitably expended in fiscal year ending June 30, 1914:	
For works of improvement	1,000,000
For maintenance of improvement	5,000
Total	1,005,000

HONOLULU HARBOR, HAWAII.

This harbor is situated on the south coast of the island of Oahu, about 9 miles east of Pearl Harbor. The entrance channel, through a coral reef, and the harbor proper, were dredged from time to time by the monarchial, republican, and territorial governments of Hawaii prior to July 1, 1904. On this date there existed an entrance channel having a minimum width of about 200 feet and a depth of about 35 feet at mean low water. The harbor proper had a general width of 900 feet. The water for about 200 feet immediately along the wharves had a depth of from 30 to 32 feet. Elsewhere there was only about 27 feet at low water. The bend at the lighthouse point was so sharp as to make it somewhat difficult for large vessels to make the turn: The harbor has an area of 184.5 acres included within the harbor lines, the present governing dimensions being 3,000 feet by 850 feet for 30-foot depth, or 3,000 feet by 600 feet for 35-foot depth.

Work on the present project was begun under an appropriation by the river and harbor act of March 3, 1905, in accordance with a general plan printed in the Annual Report of the Chief of Engineers for 1905, page 2564, but the project as specifically adopted by the river and harbor act of March 2, 1907, is printed in House Document No. 332, Fifty-ninth Congress, second session. It provides for an entrance channel 400 feet wide and 35 feet deep at mean low water from deep water at the entrance to the lighthouse point, for easing the curve at the junction of the entrance channel and the inner harbor by cutting off the lighthouse point, and for enlarging the harbor proper so that it will have a general width of 1,200 feet and a depth of 35 feet at mean low water, at an estimated cost of $1,628,894.60. No change has been made since the original project was adopted.

Between March 3, 1905, and May 27, 1908, $800,000 had been appropriated for work under the approved project, or about 49 per cent of the estimated cost.

Work under the above appropriations was stopped by practical exhaustion of funds on December 15, 1908, the following having been accomplished:

Dredging entrance channel, removing lighthouse point, and the partial widening of the harbor proper. All this dredging was to a depth of 35 feet at mean lower low water, a total of 1,910,023 cubic yards having been excavated.

For the maintenance of this harbor an allotment of $25,000 was made from the act of March 3, 1909, and during the summer of that year bids were asked for dredging the shoal places. The only bid received was rejected as excessive.

By the river and harbor act of June 25, 1910, Congress appropriated $150,000 for continuing improvement at this harbor, and from funds thus provided and from the allotment above referred to, for maintenance, two contracts were let in November, 1910, one for dredging at the north end of the harbor, and one for redredging the entrance channel. Work at the north end of the harbor was commenced in December, 1910, and completed in August, 1911; 152,063 cubic yards were removed, thereby making available for wharfage purposes an additional 500 linear feet for vessels drawing 35 feet. Work on redredging was commenced February 6, 1912, and completed March 2, 1912; 99,500 cubic yards were removed.

A survey of the harbor was made during the year. Due to the soft character of the harbor bottom, the maneuvering of steamers causes deepening in places and shoaling in others. The outer 600 feet of the entrance channel has shoaled to 33 feet in places, which is now the maximum draft under which vessels can enter the port.

On June 30, 1912, the sum of $929,204.05 had been expended on the project, and $27,345.08 had been expended for maintenance.

During the year $2 was received from the sale of maps pertaining to the appropriation.

On June 30, 1912, there was a minimum depth in the entrance channel of about 33 feet; within the harbor proper there was, outside of harbor lines, a general depth of 35 feet. The normal tidal oscillation is about 2 feet. The head of navigation is the head of the harbor, about 2 miles from the Lighthouse Department buoys marking the entrance to the harbor.

The commerce between this port and ports not in the Hawaiian Islands, for the calendar year 1911, amounted to approximately 802,311 short tons, valued at $48,943,819. The commerce with other ports of the Hawaiian Islands amounted to 362,398 short tons, valued at about $22,461,850, making a total of 1,164,709 short tons, valued at approximately $71,405,669.

What effect the improvement of the harbor has had upon freight rates can not be stated, but vessels are now able to enter and leave the harbor with their full-load draft.

The approved project for this harbor is about 70 per cent completed. Practically all of the harbor frontage available for wharfage purposes is now occupied, and the wharves are not sufficient to accommodate the present commerce without frequent congestion. It is recommended that an appropriation of $200,000 be made, with a continuing-contract provision for the balance required to complete the approved project. If this amount is made available, it is believed that a much more satisfactory price for dredging can be obtained than will be the case if a number of small contracts must be made. The United States will also be in a position to buy or build a plant and do their own work if a satisfactory price is not bid for dredging, while, if only a small amount of money is available, they will not have this course to fall back on.

When additional appropriations are made for this harbor, it is proposed to widen the harbor in accordance with the approved project.

Amount (estimated) required to be appropriated for completion of existing project	$678, 894. 60
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement and for maintenance	225, 000. 00

ALLEGHENY RIVER BRIDGES AT PITTSBURGH.

Following is the report of the Board of Engineers, dated November 23, 1910, relative to the modification of bridges over the Allegheny River at Pittsburgh, together with a memorandum of the Secretary of War relative thereto:

War Department,
United States Engineer Office,
Pittsburgh, Pa., November 23, 1910.

The Chief of Engineers, United States Army,
Washington, D. C.

Sir: The board of engineer officers constituted by S. O. No. 27, Office of the Chief of Engineers, Washington, D. C., June 15, 1909, to consider and report concerning certain bridges known as the Sixth Street Bridge, Seventh Street Bridge, Ninth Street Bridge, Eleventh Street (Pennsylvania Railroad) Bridge, Sixteenth Street Bridge, Thirtieth Street Bridge, Thirty-third Street (Pittsburgh Junction Railroad) Bridge, and Forty-third Street Bridge over the Allegheny River at Pittsburgh, Pa., has the honor to submit the following report:

2. The board convened July 19, 1909, at the engineer office, Pittsburgh, Pa., and then personally inspected the bridges in question. It investigated the complaints made and the reports of the district officers thereon. From the evidence then before it, it considered the bridges an unreasonable obstruction to navigation and specified the character of the obstructions, the changes it considered necessary to render the navigation under them free, easy, and unobstructed, and the time it considered reasonable in which to make them. The board having issued notices for a public hearing as provided by law, then adjourned to await the time set for the hearing. By direction of the Secretary of War, however, this hearing was postponed. Under further instructions of the Secretary of War the board was reconvened and held a public hearing at Pittsburgh beginning on March 8, 1910. In the interim notices of hearing were served on the owners and controllers of the bridges, copies of which are herewith marked as Exhibits 7G to 7V, inclusive, and were also furnished to the complainants and all known parties in interest, so that they would have a reasonable opportunity to be heard.

3. At the hearing both the navigation and bridge interests, by mutual agreement, were represented by attorneys, and a full presentation of the facts in the case was invited. Sessions were held from March 8 to 11, inclusive, when, on application of the parties interested, an adjournment was taken to March 22, and the sessions then resumed to March 24. All evidence, statements, or propositions having been presented to the board another adjournment was taken to enable counsel to submit such arguments as they might desire. The board reassembled on November 22 and prepared this report, the data submitted to it appearing in Exhibits A to 6A (river interests), and Exhibits 1 to 137 (bridge interests), and the printed briefs of the various counsel in Exhibits 7D and 7E (river interests), and Exhibits 152 and 153 (bridge interests). The oral testimony given at the hearings, together with all written statements in exhibits from A to 6A, is contained in Exhibit 7F (printed book entitled "In Re Elevation of Certain Bridges Over Allegheny River"). A supplemental

record of data forwarded to the board is given in Exhibits 6B to 6K (printed, except maps, in book entitled "Supplemental Record" and marked "Exhibit 7W"); Exhibits 6L to 7C (not printed), and Exhibits 144 to 147 (printed in book entitled "Additional Papers Filed with the Board of Engineers" and marked "Exhibit 154"); Exhibits 148, 150, and 151 (not printed), and Exhibit 149 (printed book of Pittsburgh Civic Commission). The various maps and photographs filed by the bridge interests are contained in album marked "Exhibit 155." Exhibits 1 to 137 (filed at hearing) and Nos. 138 to 143 (filed subsequent to hearing) are printed in book entitled "Testimony and Affidavits Filed by the Bridge Interests" and marked "Exhibit 156.'

4. The Allegheny River has been improved by the United States in the vicinity of the city of Pittsburgh, Pa., by the construction of three dams with locks, which, in connection with the Davis Island Dam in the Ohio River, create a slack-water navigation for a distance of about 25 miles from the mouth of the river. The least dimensions of the locks are 55 by 286 feet. Within the city limits the river is spanned by eight low fixed bridges, of various heights and widths of span, as shown in the table accompanying report of the district officer (E. D. 34428/134). Of these the lowest are the Forty-third and Sixteenth Street Bridges, which have a clearance above pool level of 27.7 feet and 31.9 feet, respectively; and the highest is the Thirtieth Street Bridge, with a clearance of 36 feet. The minimum width of channel span occurs in the Ninth Street Bridge, where the distance between the centers of piers is 209 feet. At the Sixteenth Street Bridge this width is only 210 feet. The maximum width is found in the Sixth Street Bridge, 445 feet.

5. The bridges were originally built by authority of the Commonwealth of Pennsylvania, but with little supervision in the interests of navigation. Some of them have a pier located in the middle of the river, while in others the span available for navigation occupies a similar position. The conditions can more clearly be determined by reference to the map of this portion of the Allegheny River found in Exhibit 7F.

6. The Sixth Street and the Pennsylvania Railroad Bridges have been rebuilt under authority of the General Government, but the permits contain special provisions that reserve to the United States the right to require increase in the clear headroom for the Sixth Street Bridge when the Secretary of War thinks the same necessary or advisable, and the rebuilding of the Pennsylvania Railroad Bridge, when the work of raising the bridges below it is commenced. The traffic over the bridges is estimated at about 60,000,000 passengers and 100,000,000 tons of freight annually, and consists of the passenger traffic of through east and west lines of the Pennsylvania and Baltimore & Ohio Railroads, a large portion of the freight originating or being received by rail in the city of Pittsburgh, trolley lines connecting the two sides of the river, and numerous vehicles and automobiles. The river traffic is given in Exhibits G, H, I, and 5G, as reported by the district officer. For the year 1909 (see Exhibit 5G) it is stated as 1,581,386 tons, of which 486,150 tons were coal and 824,236 tons sand and gravel. The coal moves from the Monongahela River up the Allegheny, while the sand and gravel move both up and down the river. Conditions are further complicated by the construction of numerous large buildings close to the river bank an elevated rail-

road near the harbor line on the left bank, and extensive freight yards with their connecting tracks.

7. The evidence submitted to the board is extremely voluminous and contradictory, but the main points at issue may be briefly stated as follows: The river interests claim that when a current exists the piers of the bridges are a dangerous obstruction to navigation on account of the narrowness of the spans or of their location, there being no correlation between the piers of the adjacent bridges; that the heights of the bridges offer a serious obstruction to navigation in that they will not permit the larger Ohio River boats to navigate the Allegheny River at any stage nor the average steamboat plying on the Monongahela River except at the lowest stages, and not even the small boats plying at present on the Allegheny River above a 12-foot stage; that they are entitled to navigate the river with the ordinary steamboat of the locality at all stages; that by reason of these obstructions the commercial development of the Allegheny Valley along the portion of the river improved by the General Government is being retarded; and that no further improvement of the Allegheny River will be undertaken until an outlet to its commerce is afforded through the bridges.

8. The bridge interests deny that the bridges in question are an unreasonable obstruction to navigation, and claim in their answers submitted during the hearing that the cases having been decided by two Secretaries of War are res adjudicata; that the Secretary of War has no jurisdiction in the matter, and the act of Congress of 1899 under which he acts is unconstitutional; that the cost of the changes proposed would be unreasonably great; that the traffic under the bridges is utterly disproportionate to the traffic over them, and rapidly declining; that the towboats in use on the river have no difficulty in passing under the bridges when the stage of water does not exceed 16 feet, and that when the stage of water exceeds 16 feet the current of the river is so swift that navigation must be suspended. They also make complaint that the proceedings have been based on ex parte evidence and incorrect findings as to the facts and the law, and that no opportunity has been given the bridge companies to be heard before the hearing, but this complaint appears to have resulted from ignorance on the part of the counsel for the bridge interests of the methods of procedure prescribed by the War Department in bridge hearings, which methods have been strictly complied with in these cases.

9. In a joint brief, submitted by the various bridge interests concerned at the close of the hearing in support of their contention that the petition of the river interests be denied, it is claimed:

First. That this case has already been twice decided upon the same facts which are here presented, each time adversely to the demand for the raising of the bridges.

Second. That the public at large is not demanding the raising of the bridges and that a few river men only are making the complaint.

Third. That these bridges are not an unreasonable obstruction to the traffic on the Allegheny River.

10. The bridge interests lay particular stress on their claim that the cases are res adjudicata, and that no new evidence has been presented at this hearing. The counsel for the river interests, however, claims that since the date of the decision of Secretary Root such

changes in the situation have taken place as will warrant the War Department in taking up this matter anew, because:

First. Locks and Dams 2 and 3 have been completed, thereby extending slack-water navigation to Natrona on the Allegheny River, a distance of 25 miles, and a further extension from Natrona to Monterey, a distance of 56 miles, has been favorably reported by the Chief of Engineers and remains in abeyance to abide the outcome of this bridge question.

Second. By the recent completion of Locks and Dams 2, 3, 4, 5, and 6 below Davis Island Dam on the Ohio River 25 miles of slack water have been added to Davis Island pool.

Third. The cities of Pittsburgh and Allegheny have been merged into a single corporation, whose municipal authorities d› not oppose the raising of the bridges.

Fourth. The Supreme Court of the United States, in the cases of the Union Bridge Co. *v.* The United States (204 U. S., 359) and the Monongahela Bridge Co. *v.* The United States (copy of decision herewith marked as Exhibit 7X, 216 U. S., 177), has decided that the owner of a bridge is not entitled to compensation for the cost of removing its obstructive features when required to do so under section 18 of the act of March 3, 1899.

Fifth. The awakening of the country to the necessity of improvement of its waterways.

11. The question of the constitutionality of the provision of the river and harbor act of March 3, 1899, under which the Secretary of War is acting, was fully discussed before the Supreme Court of the United States in the case of the Monongahela Bridge Co. *v.* The United States (216 U.S., 177), and the court in its decision reaffirmed its previous decisions in reference to the constitutionality of the act and the authority of the Secretary of War to proceed in pursuance thereof.

12. The claim that the cost of making the changes in the bridges will be unreasonably great has also received judicial consideration, the Supreme Court in the case of the Union Bridge Co. *v.* The United States having stated as follows:

> Some stress was laid in argument upon the fact that compliance with the order of the Secretary of War will compel the bridge company to make a very large expenditure in money. But that consideration can not affect the decision of the questions of constitutional law involved. It is one to be addressed to the legislative branch of the Government. It is for Congress to determine whether under the circumstances of a particular case justice requires that compensation be made to a person or corporation incidentally suffering from the exercise by the National Government of its constitutional powers.

13. The claim that the traffic over the bridges largely exceeds that under them, or the character of the freight carried, is not considered pertinent to the question at issue.

14. The law requires the Secretary of War to take action if he has good reason to believe any bridge over any of the navigable waterways of the United States is an unreasonable obstruction to the free navigation of such waters, and in the case of the Union Bridge Co. *v.* The United States the court quotes with approval a decison of the Supreme Court of Pennsylvania that: "The bridge was to be so built as not to injure, stop, or interrupt navigation, either then or now, whether in its infancy or full growth." While the board recognizes that the improvement of the rivers of the country is undertaken primarily for the benefit of the people as a whole, and not for a particular class, as boat owners, yet the public

is entitled to a reasonably unobstructed navigation of its rivers for such material as it may desire to transport thereon. The fact that a railroad has an enormous freight and passenger traffic does not give it a right to obstruct the streets of a town, even if the traffic on them is insignificant in comparison; on the contrary, when the railroad traffic becomes so large as to obstruct street traffic the railroad is compelled to elevate its tracks. While river men must be subservient to the rights of the public, in a still greater degree must other carriers, such as railroads and trolley lines, since the boatman has the same natural right to navigate a river as a pedestrian has to walk a street, while the railroad and trolley line possess only such artificial rights as are granted in their charters. To admit the contention of the bridge interests that in endeavoring to ascertain whether a bridge constitutes an unreasonable obstruction, regard must be had to the character and amount of the traffic over the bridge as well as the traffic on the river under it, would logically lead to the abandonment of river commerce wherever a railroad builds a bridge low enough to prevent any traffic passing under it.

15. It is contended that the raising of the bridges will be a serious hindrance to the traffic over them. But should it be found that they are unreasonable obstructions to navigation the decision of Judge Field, quoted by the bridge interests, that "the rights of each class are to be enjoyed without invasion of the equal rights of others" would require not an abandonment of water transportation but an added servitude to the bridge companies. The bridges should then be maintained at their existing grades and draw spans introduced, which will materially add to the cost of their reconstruction. But the board has not considered that it is necessary to impose this added cost upon the bridge companies. The grades proposed are not prohibitory, being less than those prevailing on many of the streets of Pittsburgh where there is an extensive traffic, and the convenience that results from an unobstructed passage for both land commerce and water-borne commerce will more than compensate for the slightly increased cost to wagon transportation that results from raising the bridges.

16. Numerous affidavits were presented relative to particular types of vessels for use in navigating the river, the claim being made that vessels were in existence, or could be invented, that could navigate the river without difficulty under existing conditions. The board is of the opinion that in reference to the types of vessels navigating a river the proper principles to be applied are those advocated by the Government in the case of the Monongahela Bridge Co. *v.* The United States, i. e.:

> First. Every bridge should be so constructed as to permit the passage under it or through it with reasonable safety of the average-sized boat actually navigating the stream at all practical stages of water.
>
> Second. Any bridge that does not permit the passage of such boat at such stages of water needlessly obstructs the use of the river highway and exists under conditions that are not reasonable.

17. The testimony submitted shows that the average-sized Ohio River steamboat, either with or without a tow, is unable to navigate the Allegheny River under the bridges at any stage of water, and that the average-sized steamboat on the Monongahela River would also be unable to pass under the Sixteenth Street and Forty-third Street Bridges at any stage and the other bridges only at low stages.

18. The average number of days per year that a boat 32½ feet high, the average height of a packet on the Monongahela River, will be unable to pass through the existing bridges is as follows:

	Days.
Sixth Street Bridge	105
Seventh Street Bridge	82
Ninth Street Bridge	105
Pennsylvania R. R. bridge	82
Sixteenth Street Bridge	365
Thirtieth Street Bridge	14
Pittsburgh Junction R. R. bridge	45
Forty-third Street Bridge	365

19. It is therefore evident that the height of the Sixteenth and Forty-third Street Bridges is such as to entirely prevent navigation of the Allegheny River by the ordinary western river steamboat, and the remaining bridges offer serious obstruction to such boats for long periods of time. This has necessitated the construction of a special class of boat for such navigation as is carried on in this river. These boats are able to navigate the river to a 16-foot stage, except at the Sixteenth and Forty-third Street Bridges, but appear to have insufficient power to stem the current with a tow above a 12-foot stage. The narrowness of the channel spans of some of the bridges and the location of the spans in reference to the piers of those above and below them the board also considers serious obstructions to navigation. In this respect the Ninth Street Bridge is the most objectionable. Its channel span has a width of but 209 feet between the centers of piers (196 feet in the clear). A short distance above it is the Pennsylvania Railroad Bridge, with a channel span of 337.5 feet between centers of piers, and below it within a short distance are the Seventh and Sixth Street Bridges, with piers in the middle of the river and side spans of 330 and 345 feet, respectively. A vessel moving down the river through the channel spans of the Pennsylvania Railroad and Ninth Street Bridges has to suddenly change its course to pass through the side spans of the bridges immediately below, a difficult operation in a swift current. By giving a clear midchannel span of 350 feet to the Ninth Street Bridge there is a much better opportunity for a vessel to clear the center piers of the lower bridges. The widths of span in the Sixteenth Street, Forty-third Street, and Pittsburgh Junction Railroad Bridges are also objectionable, but to a less extent than in the Ninth Street Bridge, due to their more favorable location and greater width.

20. The conclusions of the board are that the bridges spanning the Allegheny River under consideration from the Sixth Street to the Forty-third Street Bridge, inclusive, as they now exist, are unreasonable obstructions to navigation and such as to hinder the growth of river commerce; that the present harbor commerce of Pittsburgh will be sufficiently relieved of its burden by the immediate alteration of the Ninth, Sixteenth, and Forty-third Street Bridges to the heights and widths of spans specified by the board in its notices to the bridge companies; and that with any substantial growth of commerce, or further extension by Congress of the project for improving the Allegheny River the rest of these bridges, namely, the Sixth Street, Seventh Street, Pennsylvania Railroad, Thirtieth Street, and Pittsburgh Junction Railroad Bridges should then be similarly altered. Furthermore, if in the mean time any of the latter bridges are rebuilt or substantially altered, it should be required at such time to conform

to the conditions here recommended. The board is further of the opinion that a reasonable time within which to complete the changes in each bridge as specified is three years from date of service of the notice.

The changes thus specified and recommended are as follows:

Sixth Street Bridge.—That the bridge be so altered as to have 3 spans between its present Pittsburgh and Allegheny abutments, of which the middle-channel span shall have at least 400 feet clear width between piers; that the Pittsburgh end of the channel span shall be located about 416 feet distant from the building line of Duquesne Way at Sixth Street, Pittsburgh; that said channel span shall have a least clearance height of 47 feet above the Davis Island Pool (elevation 703.0) for a length of at least 180 feet, centrally located in the span, this clearance height to drop gradually so as to be not less than 32 feet at the Pittsburgh and Allegheny abutments; that no riprapping or other construction about the piers shall project above an elevation of 10 feet below the surface of said Davis Island Pool, and all parts of the old structure not in conformity with the above requirements, shall be wholly removed.

Seventh Street Bridge.—That the bridge be so altered as to have not more than 3 spans between the present Pittsburgh abutment and the Allegheny harbor line, of which the middle-channel span shall have at least 350 feet clear width between piers, the left pier of said channel span to be located 407 feet from the building line of Duquesne Way at Seventh Street, Pittsburgh; that not less than 180 linear feet of said channel span shall have a least clearance height of 47.1 feet above the Davis Island Pool (elevation 703.0), this clearance height to drop gradually so as to be not less than 27.5 feet at its shore end at the present Pittsburgh abutment, and 31.7 feet where it crosses the United States harbor line on the Allegheny shore; that no riprapping or other pier protection of the altered structure shall project above an elevation of 10 feet below the surface of Davis Island Pool, and all parts of the old structure not in conformity with the above requirements, shall be wholly removed.

Ninth Street Bridge.—That the bridge be so altered as to have not more than three spans between the present Pittsburgh abutment and the present pier on the Allegheny City wharf, of which the middle channel span shall have at least 350 feet clear width between piers, the left pier of said channel span to be located 400 feet from the building line of Duquesne Way, at Ninth Street, Pittsburgh; that not less than 180 linear feet of the central part of said channel span shall have a least clearance height of 47.3 feet above the Davis Island pool (elevation 703); that this clearance height shall drop gradually so as to be not less than 28 feet at the Pittsburgh abutment and 29.7 feet at the existing pier on the Allegheny wharf, above said Davis Island pool; that no riprapping or other pier protection of the altered structure shall project above an elevation of 10 feet below the surface of said Davis Island pool, and all parts of the old structure not in conformity with the above requirements shall be wholly removed.

Pennsylvania Railroad bridge.—That the bridge be so altered as to have a clearance height of not less than 47½ feet above the Davis Island pool (elevation 703) under the main channel span and the next two spans on its right (not urgently necessary; might be waived).

Sixteenth Street Bridge.—That the bridge be so altered as to have a channel span of at least 400 feet clear width between piers; that not less than 180 feet of the central portion of said span shall have a least clearance height of 48.2 feet above the Davis Island pool (elevation 703); that this clearance height shall drop gradually so as to be not less than 31.5 feet at the Pittsburgh abutment and 29.6 feet at the Allegheny abutment, above said Davis Island pool; that the channel span shall be so located as to place its left, or Pittsburgh, pier 20 feet nearer to the Pittsburgh shore than the present left channel pier; that no riprapping or other pier protection of the altered structure shall project above an elevation of 10 feet below the surface of said Davis Island pool; and that all parts of the present structure not in conformity with the above requirements shall be wholly removed.

Thirtieth Street Bridge.—That the bridge be so altered as to have not more than three spans, of which the middle channel span, located approximately in the middle of the river, shall have at least 350 feet clear width; that not less than 180 feet of the central portion of said span shall have a least clearance height of 51 feet above the Davis Island pool (elevation 703), this clearance height to drop gradually so as to be not less than 42 feet at the Pittsburgh abutment above the Davis Island pool; that no riprapping or other pier protection shall project above an elevation of 6 feet below the surface of Davis Island pool; and that all parts of the present structure not in conformity with the above requirements shall be wholly removed.

Pittsburgh Junction Railroad bridge.—That the bridge be so altered as to have not more than 3 spans, of which the middle channel span, located approximately in the middle of the river, shall have at least 350 feet clear width; that not less than 180 feet of the central portion of said span shall have a least clearance height of 51 feet above the Davis Island pool (elevation 703.0), this clearance height to drop gradually so as to be not less than 49 feet at the Pittsburgh abutment and 45 feet at the Herr Island abutment, above the Davis Island pool; that no riprapping or other pier protection shall project above an elevation of 6 feet below the surface of Davis Island pool; and that all parts of the present structure not in conformity with the above requirements shall be wholly removed.

Forty-third Street Bridge.—That the bridge be so altered as to have not more than 3 spans, of which the middle channel span shall have at least 350 feet clear width between piers; that not less than 180 feet of the central portion of said channel span shall have a least clearance height of 51 feet above the Davis Island pool (elevation 703.0); that this clearance height shall drop toward each shore at a rate not exceeding 5 feet in 100; that the right pier of the channel span shall be placed in the same position as is the right pier of the present bridge; that no riprapping or other pier protection shall project above an elevation of 6 feet below the surface of Davis Island pool; and that all parts of the present structure not in conformity with the above requirements shall be wholly removed.

Very respectfully, your obedient servants,

W. H. Bixby,
Brigadier General, Corps of Engineers, United States Army.
Wm. T. Rossell,
Colonel, Corps of Engineers, United States Army.
C. McD. Townsend,
Colonel, Corps of Engineers, United States Army.

A petition was filed before my predecessor in office, Secretary Wright, alleging eight bridges over the Allegheny River at Pittsburgh to be unreasonable obstructions to the free navigation of that river within the meaning of the river and harbor act of March 3, 1899 (30 Stat. L., 1121, 1153). Notices and hearings were given to all the parties in interest by the board of engineer officers constituted to consider and report the matter. Voluminous and contradictory evidence was taken. Full opportunity was given to all concerned to present evidence. The board found that all of said bridges, known as—

(*a*) Sixth Street Bridge,
(*b*) Seventh Street Bridge,
(*c*) Ninth Street Bridge,
(*d*) Eleventh Street Bridge (Pennsylvania Railroad),
(*e*) Sixteenth Street Bridge,
(*f*) Thirtieth Street Bridge,
(*g*) Thirty-third Street Bridge (Pittsburgh Junction Railroad), and
(*h*) Forty-third Street Bridge,

are, as they exist, unreasonable obstructions to free navigation; and also that—

> the present harbor commerce of Pittsburgh will be sufficiently relieved of its burden by the immediate alteration of the Ninth, Sixteenth, and Forty-third Street Bridges to the heights and depths of spans specified by the board in its notices to the bridge companies; and that with any substantial growth of commerce or further extension by Congress of the project for improving the Allegheny River the rest of said bridges, namely, the Sixth Street, Seventh Street, Pennsylvania Railroad, Thirtieth Street, and Pittsburgh Junction Railroad Bridges, should then be similarly altered.

Gen. Bixby, who was a member of the board and while so acting succeeded to the office of Chief of Engineers, has as Chief of Engineers concurred in the recommendation of the board. It was his unavoidable duty, as Chief of Engineers, to act upon the report.

Owing to the large interests involved and the difficulty of the questions, I, upon the request of the parties interested, heard oral arguments, which have been supplemented by printed briefs.

A similar proceeding in respect of the same bridges was begun before Secretary of War Root, who decided, August 23, 1904, as follows:

> I do not think it can be successfully maintained that these bridges constituted any unreasonable obstruction to navigation on the Allegheny River before the artificial waterway was created by means of locks and dams, nor do I think, having in view the relative importance and rights of the commerce over the bridges as compared with the commerce under them even with the slackwater navigation already provided, that obstruction of the bridges is now unreasonable. * * * The obstruction offered by these bridges to navigation of the Allegheny is not, in my judgment, unreasonable under all the circumstances which have been proved.

There was a rehearing before Secretary Taft in 1908 upon, as he stated it, exactly the same evidence and upon exactly the same state of law. He declined for that reason to reverse the judgment rendered by Mr. Root, following, doubtless, the principle laid down by him in a previous similar case that "the orders of this department are not to be lightly set aside, and are to be treated as a decree in equity would be and be set aside only upon a showing of a palpable error or mistake." (204 U. S., 372.)

Secretary Taft resigned on June 30, 1908, and Secretary Wright was appointed July 1, 1908. This proceeding was begun before Secretary Wright on November 30, 1908.

The duty imposed upon a Secretary of War to enforce the statute is a continuing one under conditions as they may exist from time to time. While, in my judgment, one Secretary of War is not concluded, even upon the same state of facts, by the judgment of a predecessor, yet such a judgment should not upon a new proceeding be overruled unless it plainly appears that an error has been made. Such a judgment should, unless there is plain error, bring repose, and parties should not be harassed by experimenting with successive heads of departments.

In recognition of this principle counsel for the petitioners says that since Secretary Root's decision such changes have taken place as warrant the War Department in taking up the question anew. It is said that Locks and Dams Nos. 2 and 3 have been completed, the former in 1908 and the latter in September, 1904; that slack-water navigation has been extended thereby to Natrona, a distance of 25 miles from the mouth of the Allegheny; and that the whole purpose of this improvement will be lost unless the bridges are raised sufficiently to afford free passage of suitable boats at all navigable stages; and that 56 miles favorably reported on by the Chief of Engineers remains in abeyance to abide the outcome of the bridge question.

I do not consider that in determining whether or not a bridge is now an unreasonable obstruction to free navigation, legitimate consideration can be given to the fact that the raising of the bridges may favorably dispose Congress to make appropriations for river improvement. Congress needs no such aid from the War Department and never invested it with any such function. The completion of Locks and Dams Nos. 2 and 3 does not in my judgment materially alter the question of obstruction to navigation as it was presented to Secretaries Root and Taft. Mr. Root rendered his decision January 23, 1904. Dam No. 3 was under construction and was completed November 10 of that year. Dam No. 2 was under construction. These works were under him and he knew the effects they would have upon the river, and that even if he should give an order for the removal of the bridges it could not be consummated before these effects would be in existence. That he took them into consideration is shown by his statement that—

> This system was begun by the construction of the Davis Island Dam below Pittsburgh in 1885, continued by the construction of the Herrs Island Dam under the river and harbor act of 1886, and is further to be extended by the construction of two additional locks and dams under the river and harbor act of 1896.

The Herrs Island Dam, which is Allegheny Dam No. 1, was completed January 1, 1903, and carried slackwater navigation at the time Mr. Root made his decision to a point up the river beyond all the bridges in question. He said that he did not consider, "even with the slackwater navigation already provided that obstruction of the bridges is now unreasonable."

Secretary Taft reheard the case in February, 1908, after all three of the dams had been completed. Dam No. 3 had been blown out and was being rebuilt. He necessarily knew and could not ignore these facts and the effect that they would in the immediate future have upon navigation, and yet he said that the case was presented to him and to Secretary Root upon exactly the same evidence. He must have regarded that Secretary Root in passing upon the question of unreasonable obstruction considered the effect of the slackwater navigation not only that then existed to a point up the river beyond all of these bridges, but its extension by those locks and dams when completed to Natrona. These bridges were then just as much an obstruction to navigation as they are now. The fact that Locks and Dams Nos. 2 and 3 have been completed since Secretary Root's decision does not, in my judgment, substantially affect the situation.

The second fact set up to show a change in the case is that certain locks and dams have been, since Mr. Root's decision, completed below Davis Island Dam on the Ohio River by which 25 miles of slackwater have been added to Davis Island Pool. There was navigation on the Ohio River before these dams were completed for the same character of boats as now. These bridges were then as much an obstruction to navigation for that class of boats as they are now. While completion of those locks and dams may increase the volume, they do not alter the means of traffic.

The third ground stated is that the cities of Pittsburgh and Allegheny have been merged into one corporation. The two cities opposed the raising of the bridges, as does now the city of Pittsburgh. While the fact of there being one municipal charter instead of two might affect the methods of complying with an order, it has no bearing upon the question of whether or not the bridges unreasonably obstruct navigation.

It is stated as a fourth reason why the situation is changed that the Supreme Court has held the statute in question to be constitutional, and decided that the owner of a bridge unreasonably obstructing free navigation is not entitled to compensation for the cost of removal. The questions of constitutionality and compensation had nothing to do with the fact adjudged by Mr. Root.

Finally, it is said that the country has awakened to the necessity of improvement of our waterways; that the two great political parties have taken note of the situation in their platforms; that conventions have assembled; that the National Rivers and Harbors Congress meets annually to induce congressional action and that Congress has recognized the gravity of the situation by appointing a National Waterways Commission. These considerations constitute strong grounds for legislative action, but can not be looked to in executing a statute which authorizes only the finding whether or not these bridges unreasonably obstruct free navigation.

The principle enunciated by Mr. Root and tacitly approved by Mr. Taft was that there should, in passing upon the question of whether or not a bridge constituted an unreasonable obstruction to free navigation, be taken into consideration "the relative importance and rights of the commerce over the bridges as compared with the commerce under them," that "practically every bridge is some obstruction to navigation," and that "the statute imposes upon the Secretary of War the duty not merely to determine whether there is an obstruction but also to determine whether, under all the cirstances of water commerce and land commerce, public right and private right, relative benefit and relative inconvenience and hardship, that obstruction goes beyond the bounds of reason."

Following these principles, which I consider sound, I have carefully considered all of the facts and arguments presented to me and am not only of the opinion that the case before me is substantially the same heretofore determined, but that no plain error was committed. I am inclined to the view that the judgment was correct. While I have great respect for the Board of Engineers and the Chief of Engineers, who not only have the highest technical training and experience in all questions of river navigation but are the only persons connected with the findings who have acted under the obligations of official duty, and upon their findings in a matter of technical knowledge could let my mind rest easily even under the weight of much countervailing proof, yet, whereas in this case, in my judgment, they proceeded as to some considerations upon erroneous principles, I must apply such tests in weighing the soundness of their conclusions.

Secretary Root gave much weight to the relative volume of traffic passing over and under the bridges. As to this they say:

> The claim that the traffic over the bridges largely exceeds that under them or the character of the freight carried is not considered pertinent to the question at issue.

In reaching their conclusion they also say:

> The board is of the opinion that in reference to the types of vessels navigating a river the proper principles to be applied are those advocated by the Government in the case of Monongahela Bridge Co. *v.* The United States, i. e., first, every bridge should be so constructed as to permit the passage under it or through it with reasonable safety of the average-size boat actually navigating the stream at all practical stages of water (p 12).

They apply this to boats 32½ feet high, the average height of a packet on the Monongahela. It was in respect of this class of boats that Secretary Root decided that the bridges were not an unreasonable obstruction.

The Chief of Engineers and the board, after finding that all of the bridges "as they now stand" are unreasonable obstructions, express the opinion that "the present requirements of river commerce may be reasonably met" by the immediate alteration of three of them. If the five other are not now so obstructive to commerce as to require alteration, it is difficult to appreciate that they "as they now stand" unreasonably obstruct navigation. If I should reach the conclusion reached by the engineers that they are "as they now stand" unreasonable obstructions, it is my plain duty to now order them to be changed. If I should find that they are not now such unreasonable obstructions as to require change, and that the necessity for such an order must be determined by future development, then it would be manifestly improper for me now to render any judgment that they are unreasonable obstructions. The result of the finding and recommendation is that while all are now obnoxious to the law, only three are to be removed, with the idea that from their alteration conditions may come which will obviate the necessity, under the existing status of river improvement and commercial capacity, for altering the others.

Naturally the owners of these bridges which are included in a general condemnation, growing out of the present status, sufficiently common to all to make them obnoxious to the statute, object to execution being proceeded with in advance as to them, upon the idea that relief may thereby, for an appreciable time at least, accrue to the other offenders. If I hold that all of them, according to the finding of the board, as they now stand unreasonably obstruct navigation, then I should order all to be altered, not necessarily, however, fixing the same period for each within which the changes must be made, for that would produce public inconvenience. The main facts as to obstruction are substantially the same. This and the former proceedings were brought mainly on account of the height of the bridges.

The recommendation of the Chief of Engineers in substance is that notice be given to the owners of three of the bridges that the specified changes must be made within three years, and that notice be given to the owners of the other five bridges that my judgment is that they are unreasonable obstructions to navigation, that their alteration as specified by the board would be necessary under existing conditions to render navigation under them reasonably free, easy, and unobstructed, but that the issuance of a formal order will be withheld at present. If I should concur in the finding that all of the bridges as they now stand unreasonably obstruct navigation, then to follow the recommendation would, in my judgment, be in violation of the statute which says that "whenever the Secretary of War shall have good reason to believe," etc., * * * "it shall be the duty of the said Secretary" to give notice "so to alter the same as to render navigation through or under it reasonably free, easy, and unobstructed."

There is no authority to determine a bridge as it now is to be an unreasonable obstruction and to give notice, notwithstanding such determination, that notice conditioned on future developments may be given requiring changes. If this notice to be given in the future is to depend on such developments, then manifestly it would require another reference to find out whether or not conditions requiring such notice then exist. Therefore a holding now that the bridges are an unreasonable obstruction could not be regarded as final. The final determination upon which action would be taken or withheld would be a matter of future judgment.

For the foregoing reasons I do not approve of the recommendations and decline the prayer of the petitioners.

J. M. DICKINSON,
Secretary of War.

WASHINGTON, D. C., *March 6, 1911.*

BASS HARBOR BAR AND DEER ISLAND THOROUGHFARE, ME.

Following are extracts from a report on a recent examination and survey, printed in House Document No. 1128, Sixty-second Congress, third session:

WAR DEPARTMENT,
OFFICE OF CHIEF OF ENGINEERS,
Washington, November 25, 1912.

From: The Chief of Engineers.
To: The Secretary of War.
Subject: Examination and survey of Bass Harbor Bar and Deer Island Thoroughfare, Me.

1. There are submitted herewith, for transmission to Congress, reports dated August 28, 1911, September 13, 1912, and November 1, 1912, with maps, by Lieut. Col. W. E. Craighill, Corps of Engineers, on preliminary examination and survey, respectively, of Bass Harbor Bar and Deer Island Thoroughfare, Me., authorized by the river and harbor act approved June 25, 1910.

2. Bass Harbor Bar is a shoal extending from the southerly extremity of Mount Desert Island. Deer Island Thoroughfare is a narrow passage about 9 miles long, on the southerly side of Deer Island. Both of these localities are on the route used by the many small coasting vessels and steamers plying along the coast of Maine, and the latter is also used by vessels engaged in taking stone from Stonington, which is situated in a cove on the northerly side of the thoroughfare. The improvement desired in each case is an increase in channel dimensions to render navigation safer.

3. The plan recommended by the district officer for improvement of Bass Harbor Bar contemplates the excavation of a channel not less than 14 feet deep at mean low tide for a width of 250 feet across the bar, at an estimated cost of about $10,000. (It is believed that there will be no maintenance work required, and no estimate therefor is submitted.) For the improvement of Deer Island Thoroughfare the district officer proposes to remove obstructing ledges to a depth of 15 feet at mean low tide for a width of about 300 feet. The cost of this work is estimated at $40,000, and it is believed that no expenditures for maintenance will be required.

4. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, to whose report dated November 11, 1912, attention is invited. The board and the division engineer concur in the opinion expressed by the district officer.

5. After due consideration of the above-mentioned reports, I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of Bass Harbor Bar and Deer Island Thoroughfare, Me., is deemed advisable so far as to secure an available channel depth of 14 feet at Bass Harbor Bar and 15 feet at Deer Island Thoroughfare, with channel widths of 250 feet and 300 feet, respectively, increased at entrances and on curves, following in general the methods described in the report of the district officer, at estimated costs of $10,000 and $40,000, respectively, these estimates being based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of the entire estimated cost.

H. Taylor,
Lieut. Col., Corps of Engineers,
Acting Chief of Engineers.

It is impracticable to give definite statistics as to the commerce at Bass Harbor Bar. Much of the great movement of small coasting vessels and steamers along the coast of Maine uses the passage. The small coasting vessels which are moving throughout the year run along the coast from harbor to harbor, coming in at night or when the weather is threatening. This necessitates their keeping close to the coast. Bluehill Bay, under the lee of Great Gotts, Placentia, and Swan Islands, affords good shelter. The wide passage to the southwest would seem to afford a better opportunity, but skippers claim that in coming from the east on the approach of darkness they have to run for Bass Harbor Head light, the only one near, and to secure shelter necessitates crossing the bar. Besides this, it is a more direct passage. Towboats are not available on that part of the coast, and in the event of light winds with darkness coming on, or of snowstorms or fogs threatening, it behooves these small craft to secure shelter and to do it as quickly as possible. Aside from the great number of coasting vessels there are regular lines of steamers of the Eastern Steamship Co., Maine Central Railroad Co., Vinalhaven & Rockland Steamboat Co., and Maine Coast Transportation Co. The Sagadahoc Towing Co., which is engaged in the business of towing barges along the coast, states that its tonnage amounts to some 24,000 tons. The movement of lime, stone, and other products by coasting vessels is so important that it should receive serious consideration.

Deer Island Thoroughfare is in the midst of a great granite district, and all transportation is of necessity conducted by water. Stonington, which lies on a cove on the northerly side of the Thoroughfare, is a place of considerable importance. There are a number of large granite quarries located along the thoroughfare, and the shipments of stone out and of supplies in give rise to considerable commerce aside from that simply passing through. The Maine Central Railroad Co.'s boats make daily round trips four months and two trips per week the balance of the year. The Eastern Steamship Co. runs on the same schedule. The Vinalhaven & Rockland Steamboat Co. makes a daily round trip the year around. The Maine Coast Co. steamers make two trips per week. The sailing vessels which frequent Stonington are from 78 to over 200 feet in length and draw from 7 to 24 feet. The receipts and shipments at Stonington alone are said to amount to about 50,000 tons per annum and the passengers to number from 2,200 to 2,500 per month over one line alone. Mr. John L. Goss, who has large granite quarries, states that there are from 150 to 200 sail per year which take stone from Stonington. The material is distributed all along the Atlantic coast as far south as Galveston. Shipments designed for the interior are carried to railroad points and there reshipped, much of it going through Boston. Vessels coming from the west at night are obliged to stay out in the bay, whereas if the channel were better it is claimed that after making Mark Island Light (Thoroughfare Light) they could go into the thoroughfare and reach safe anchorage. In addition to the tonnage given for Stonington must be added the 24,000 tons handled annually by the Sagadahoc Towing Co. and the great amount of coastwise traffic which I am unable to even estimate.

CARVERS HARBOR, VINALHAVEN, ME.

Carvers Harbor is a small harbor indenting the southern shores of the island of Vinalhaven, lying in the outer portion of the entrance to Penobscot, Bay, Me. The island is so far removed from the mainland that there is no communication except by water. The village of Vinalhaven, a place of considerable importance, is located at the head of the harbor. Regular transportation consists in a steamboat line to Rockland, which makes two round trips per day nine months of the year and one round trip per day during the remaining three months, and the Maine Coast Co., which operates two freight steamers between Portland, Boston, and Machiasport, landing at Vinalhaven each way once a week. The sailing distance to Rockland is about 15 miles.

Vinalhaven is in the midst of the Penobscot granite region, and large quantities of that material are shipped from this to neighboring places. There has also developed quite an extensive business in fish—frozen, salt, and fresh. Aside from this there is considerable in the way of general merchandise for the inhabitants, supplies for the quarries, etc. The statistics for the port of Vinalhaven for 1910 are as follows:

	Tons.
Stone	42,000
Coal and wood	5,631
Merchandise	4,200
Grain, feed, sand, lumber, cement, etc	2,200
Fish	11,500
Salt	3,000
Glue stock and glue	2,300
Lobsters	475
Fertilizers	400
Total	71,706

The following letter, submitting report on a recent survey, is printed in House Document No. 624, Sixty-second Congress, second session:

War Department,
Office of the Chief of Engineers,
Washington, March 12, 1912.

Sir: I have the honor to submit herewith, for transmission to Congress, reports dated August 28, 1911, and January 24, 1912, with map, by Lieut. Col. W. E. Craighill, Corps of Engineers, on preliminary examination and survey, respectively, of Carvers Harbor, Vinalhaven, Me., prepared in pursuance of a provision in the river and harbor act approved February 27, 1911.

An area of about 23 acres in the inner harbor at this locality has previously been dredged by the United States to a depth of 16 feet at mean low water. The improvement now desired is the deepening of the southeasterly side of the harbor to 10 feet at mean low water, to provide anchorage grounds for light-draft vessels with a view to relieving the congested conditions of the deeper part of the harbor.

The district officer presents with favorable recommendation a plan for the desired improvement, contemplating dredging two areas indicated on the accompanying map, so arranged as not to involve any ledge removal. The estimated cost of dredging these areas, aggregating about 7 acres in extent, is $16,000. The district officer states that there should be no necessity for maintenance, at least for a number of years, and consequently no estimate therefor is submitted. The favorable report of the district officer is concurred in by the division engineer.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated February 6, 1912, concurring with the division engineer in the views of the district officer.

After due consideration of the above-mentioned reports, I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for

Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of Carvers Harbor, Vinalhaven, Me., is deemed advisable so far as to secure a depth of 10 feet at mean low tide over the areas designated on the accompanying map, at an estimated cost of $16,000 for first construction; this estimate being based on the supposition that the work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of the entire estimated cost.

Very respectfully,

EDW. BURR,
Acting Chief of Engineers.

The SECRETARY OF WAR.

PEPPERELLS COVE, ME.

Pepperells Cove is on the easterly or Maine side of Portsmouth Harbor, and about 1 mile within the entrance, and has never before been under improvement by the United States. The depth varies from 1 to 11 feet at mean low tide, and at the entrance there is a ledge with a depth of only about 5½ feet. These conditions make the cove of restricted value to vessels.

The existing project, adopted by the river and harbor act of June 25, 1910, is in accordance with plan printed in House Document No. 1081, Sixtieth Congress, second session, and provides for dredging an area of about 41 acres to a depth of 12 feet at mean low tide and for removal of the ledge to a depth of 12½ feet. The work was estimated to cost $158,400.

The dredging which was in progress at the close of the last fiscal year was continued, and a new contract with the same concern covering the remainder of the dredging has been made. At the close of the fiscal year 1912 about 76 per cent of all the dredging had been accomplished, or about 46 per cent of the project, all work done being in accordance with the project as adopted.

The ledge excavation will be undertaken after the dredging is completed.

The total expenditures have been $48,612.61, all for new work.

The mean range in tide is 8.7 feet.

Pepperells Cove itself has no commerce worthy of consideration as such. The purpose of the improvement is to increase the anchorage area for craft entering Portsmouth Harbor, and it is in connection with the latter that the project assumes importance. The improvement is not expected to directly affect freight rates, but to provide an anchorage and harbor for small vessels.

The commerce of Portsmouth Harbor for the calendar year 1911 is reported as 610,716 short tons, nearly all coal. The estimated value of the commodities is $2,762,822.

All the dredging will probably be completed by the close of the present working season. The new appropriation asked for is to be applied to the ledge excavation, which will be necessary to make the improvement safe and fairly available.

Amount (estimated) required to be appropriated for completion of existing project	$63,400
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	63,400

PLYMOUTH HARBOR, MASS.

Following is the report of the Board of Engineers on a recent survey, printed in House Document No. 1194, Sixty-second Congress, third session. The Chief of Engineers concurs therein.

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
December 6, 1912.

To the CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. From the report of the district officer on survey of Plymouth Harbor, it appears that through the cooperation of the town of Plymouth and the State of Massachusetts, a channel 150 feet wide and 18 feet deep has been dredged from the entrance to Plymouth Harbor to the wharves of the Plymouth Cordage Co., at a cost of about $145,000. The Plymouth Cordage Co. is located about 2 miles from the town of Plymouth in a northwesterly direction therefrom, and this channel is available only for the uses of the cordage company.

2. The existing project provides for a channel in the harbor 9 feet deep and 150 feet wide, with a turning basin at the town wharves. The work now desired by the people of Plymouth is a dredged channel 18 feet deep, so that vessels of greater draft

may reach the town wharves. In his study of this subject the district officer has prepared several plans and estimates for such a channel. The route which appears best adapted for the purpose intended is shown on the map as channel No. 1, and this is the only route receiving serious consideration. With dimensions of 18 feet in depth by 200 feet in width, the estimated cost is $167,000, while with similar depth and a width of 150 feet, the estimate is $125,000. The district officer did not consider it advisable for the United States to undertake this improvement.

3. Interested parties were notified of the unfavorable report of the district officer and given an opportunity of presenting their views to the board. On April 17, 1911, Hon. R. O. Harris, M. C., appeared before the board in behalf of the improvement and presented a number of communications (not printed) from citizens of the locality bearing upon this subject. The matter has since been held under advisement to afford the interests concerned further opportunity to submit data regarding the necessity for the proposed improvement. Among other papers received by the board is a letter of August 16, 1912, from the Board of Harbor and Land Commissioners of the State of Massachusetts, in which the commission expresses the opinion that the State should cooperate with the Federal Government by defraying a portion of the cost of the improvement. This paper having been referred to the district officer, with request for supplemental estimates of cost of channels 12 and 15 feet deep, he reports adversely on providing either of these lesser depths, but expresses the opinion that the locality is worthy of improvement by the United States to the extent of creating a channel 18 feet deep, 200 feet wide, suitably widened at the bends, at a total estimated cost of $167,000, provided one-half of this cost be contributed by the State. The division engineer concurs in the views of the district officer.

4. After mature consideration of all the information now available, the board concurs with the district officer in believing that it is advisable for the United States to enlarge its project for improvement of Plymouth Harbor to the extent of creating a channel 18 feet deep and 200 feet wide, via route 1, as indicated on the accompanying tracing, at a total estimated cost of $167,000, contingent upon cooperation by the State of Massachusetts or other interests to the extent of defraying one-half of the cost of the improvement. The estimate for maintenance of a channel 150 feet wide is given as $5,000, and it is believed that approximately that amount will serve for the channel now recommended. The full amount of the share to be paid by the United States, $83,500, should be provided in one appropriation.

5. In compliance with law, the board reports that except as contemplated by the above recommendations there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

Wm. T. Rossell,
Colonel, Corps of Engineers, Senior Member of the Board.

The following is extracted from the report on preliminary examination:

The commercial claims of the locality for recognition by the General Government are well stated in the appended letter; it covers fully the reasons why the breakwater is desired by the citizens of Plymouth, states that the value of the annual manufactures in the town approximates $14,000,000; that raw material from Mexico and the Philippine Islands, and valued at $7,000,000 annually, has up to this time reached the Plymouth Cordage works by rail, but that the new channel provided jointly by the State of Massachusetts and the town of Plymouth will result in its delivery at the cordage company's wharf in the original bottoms, as vessels of 3,500 tons can now reach the wharf; in addition to this $7,000,000 annual foreign imports, a domestic annual commerce of 50,000 tons of coal and lumber valued at about $200,000 and foreign exports amounting to $2,000,000 is claimed, and a passenger business of 30,000 persons; that each winter the United States Fish Commission keeps a steamer at Plymouth collecting codfish spawn; that there are 4,000 vessels per annum seeking anchorage in the harbor; the claim is made that Plymouth actually stands twelfth in the United States in the order of harbors arranged according to the aggregate of imports and exports; that it stands third in the list of such ports in New England, and second in the State of Massachusetts; that Plymouth Harbor is the only deep-water inlet between the mouth of the Cape Cod Canal and Boston, about 56 miles apart, the water in Massachusetts Bay being proverbially rough; that the completion of the Cape Cod Canal will bring Plymouth Inlet close to the routes of 50,000 vessels passing between New York and Boston; that its entrance is straight and free from outlying shoals and rocks; that there is also a possibility that Plymouth may be the terminus of an intracoastal canal from Taunton River to Boston; that the cordage company, the largest plant making rope and binder twine in the world, distributes its products over the entire United States via a railroad line independent of Boston; that Plymouth is thus a distributing point of distinctive importance; that the harbor is landlocked, 3½ miles in area, with shores not over 2½ miles from deep-water anchorage, with easily deepened interior channels; that between Plymouth and Kingston for 4 miles the railroad track is between 300 and 2,000 feet only from the shores, and that 3 more miles of railroad to South Duxbury are not far from the shore; that the inlet is 24 feet deep at low tide, is straight and leads to a deep inner anchorage ground; that the town, with only 12,000 inhabitants, has paid out $90,000 for railroad facilities and has contributed largely to the State in paying for deepening its channels of approach; that it is the only port of refuge on Massachusetts Bay south of Boston in reach of $263,000,000 worth of annual commerce passing by sea through Massachusetts Bay, and that 500,000 passengers will make the trip between Boston and New York annually by the Cape Cod Canal; that its commerce exceeds somewhat that of Charleston, S. C., which port has been improved by the United States at a cost of $4,675,000, while the breakwater asked for Plymouth would probably cost not over $1,000,000, one-quarter as much; that the breakwater is outside the harbor proper and can not be built by the State or private parties, being plainly in the province of the General Government; that a prospective commerce of $75,000,000 and 500,000 passengers passing through the Cape Cod Canal will pass directly in front of Plymouth Harbor, or will enter thereat; that the town itself in 1909 voluntarily paid $12,000 to redredge the channel previously dredged to the town wharves by the United States.

HARBOR OF REFUGE AT BLOCK ISLAND, R. I.

This island is about 14 miles east of the eastern end of Long Island and about 10 miles distant from the nearest point of the mainland.

Before the construction of the present harbor, Block Island had no harbor at all. The inner harbor is about 1,000 feet in its greatest dimension by about 800 feet at right angles to it; nearly two-thirds of this area has a depth of 10 feet at mean low water. The outer harbor is protected on the east side by a breakwater extending about 1,000 feet northward from the inner harbor. From the northwest to south the harbor is protected by the land. It is about 13 miles south by west from Point Judith Harbor and about 25 miles southeasterly from Stonington Harbor, Conn.

Between 1870 and 1876, $285,000 was appropriated for a breakwater on the eastern side of the island for a harbor for medium-draft vessels, this work being completed in 1878. Between 1880 and 1882, $25,000 was appropriated for dredging an inner basin and the protection of the shore next to the breakwater, this work being completed in 1884. In 1884, $15,000 was appropriated for additions to the breakwater, this money being so spent and the work completed in 1884–85.

The project of 1884, as modified in 1888, provided for the construction of a harbor of refuge consisting of an inclosed inner harbor 800 feet square, protected by an L-shaped breakwater, for small vessels, and an exterior harbor for larger ones, protected by the original breakwater, at a total cost estimated in 1888 at $75,000. This project was practically completed in 1893.

The total expenditure prior to commencing work on the existing project was $400,575.17.

The existing project of June 3, 1896, is based on the report of a survey printed in House Document No. 83, Fifty-fourth Congress, first session, and provides for raising the entire breakwater to proper height and stopping sand leaks between certain points and dredging the main inner harbor to a depth of 10 feet, at an estimated cost of $83,985. This project has been completed, and the funds available are for maintenance, but have not been expended, pending the action of Congress on a project as proposed in House Document No. 828, Sixtieth Congress, first session.

Until the act of July 25, 1912, was passed no modification had been made in the existing project since its adoption beyond the removal of the portion of the north wall of the inner harbor lying between the entrance to the harbor and the main breakwater, as recommended on page 10, report of the Board of Engineers, printed in House Document No. 60, Fifty-eighth Congress, second session. The project under which work was prosecuted provided for raising the entire breakwater to proper height, stopping sand leaks between certain points, and dredging the main inner harbor to 10 feet depth at mean low water including the removal of the spur above referred to.

The river and harbor act approved July 25, 1912, adopted a project for additional improvement in accordance with report printed in House Document No. 828, Sixtieth Congress, first session, which contemplates straightening and rebuilding certain portions of the breakwater and in dredging the anchorage to a depth of 15 feet at mean low water, at an estimated cost of $132,000, and made an appropriation of $30,000 for the purpose.

No operations have been in progress during the past fiscal year. The expenditures were for contingencies and care of lights.

The sum of $130,644.06 had been expended on the existing project up to June 30, 1912, of which $30,455.14 was for maintenance.

By the expenditures made, the existing project had been completed, the entrance to the inner harbor which had shoaled up from the drift of sand had been partially dredged to a depth of 12 feet and redredged to a depth of 10 feet several times. The north wall of the inner harbor had been strengthened and repaired.

The improvement provides an anchorage area of about 17 acres, with a least depth of 10 feet at mean low water, 10 acres of which is within the walls of the inclosed inner harbor.

The mean rise and fall of the tide is about 3 feet.

The commerce of the harbor in 1911 amounted to 10,177 short tons, valued at $498,698.90, chiefly fish and general merchandise.

It is proposed to apply the available funds to maintaining the breakwater and for maintaining the depth in the protected area by dredging when necessary. The additional appropriation recommended for the fiscal year 1914 will be applied to work under the new project adopted by the act of July 25, 1912.

Amount (estimated) required to be appropriated for completion of existing project	$102,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	50,000

POINT JUDITH HARBOR OF REFUGE, R. I.

For report on the adopted project see page 37. Following are extracts from House Document No. 911, Sixtieth Congress, first session:

War Department,
Office of Chief of Engineers,
Washington, April 20, 1908.

Sir: The act of Congress of March 2, 1907, in the item for improving Point Judith harbor of refuge, provides also that "the Secretary of War may cause an examination to be made with a view to determining whether a breakwater on the westerly side of said harbor of refuge is necessary to prevent sand movements, or for the protection of the sheltered area within the same, and also what further improvements, if any, should be made therein."

This examination has been made and reported on by the district engineer officer, Col. J. H. Willard, Corps of Engineers, under date of January 22, 1908, and the case has been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and reported upon by that board under date of April 13, 1908. These reports are herewith. They are in harmony in their main recommendations, differing only as to the advisability of raising the easterly arm of the breakwater, which is not recommended by the local officer, but which is recommended by the Board of Engineers for Rivers and Harbors. The report of the board is concurred in by the Chief of Engineers, and is the basis of the following statement:

The result of the inquiry is summed up in paragraph 16 of the report of the Board of Engineers for Rivers and Harbors, which is as follows:

"In conclusion, the board recommends that the project for the construction of a harbor of refuge at Point Judith be modified to provide for a westerly breakwater extending from the shore to a point 1,600 feet from the end of the main breakwater, the deepening of the western entrance, the dredging of shoal areas within the harbor, and of a channel affording approach to the Government reservation, as recommended by the district officer, at a total cost of $846,502.80, or $452,191.80 in excess of the cost of completing the existing project; and in addition to this work recommends increasing the height of the easterly shore arm 5 feet. It also recommends that the completion of the seaward end of the easterly breakwater, which is already provided for, should be on a line running toward the end of the main breakwater, as suggested above."

The estimated cost of raising the easterly shore arm of the breakwater 5 feet, which is not given by the board, is reported by the district officer to be $75,000, making the total cost of the improvements of the Point Judith harbor of refuge which are under the jurisdiction of the War Department $921,502.80, or $527,191.80 in excess of the cost of completing existing project.

It is recommended that the project be modified as above stated.

It has been represented to the Secretary of War by commercial interests that the further improvements referred to in the act of Congress include matters other than those pertaining to the War Department and heretofore considered in connection with the Point Judith harbor of refuge project. These additional subjects include a landing place for vessels in distress in connection with the Life-Saving Service and other Government departments having maritime interests, and also include lights and fog signals.

As these last subjects pertain to other departments of the Government, the Secretary of War on February 28, 1908, addressed letters to the Secretary of the Treasury and the Secretary of Commerce and Labor, and the replies are herewith.

The report of the local engineer officer and of the Board of Engineers for Rivers and Harbors considers only matters specially pertaining to the War Department.

Very respectfully,

A. MACKENZIE,
Brigadier General, Chief of Engineers, United States Army.

The SECRETARY OF WAR.

The following is extracted from the report of the Board of Engineers:

The addition of 5 feet to the height of the easterly shore arm breakwater, which is also desired by the interests concerned, is believed by the district officer to be unnecessary. After careful consideration of available information as to storm conditions at this harbor, and particularly having in mind the statement that during easterly and southeasterly storms the waves break completely over this breakwater, it appears to the board that the proposed increase in height is desirable in order to afford more perfect protection to the area immediately behind the breakwater. There is no estimate of cost now available for raising this breakwater to an additional height of 5 feet, as above recommended, but such an estimate can be secured from the district officer at any time.

The existing project provides for an opening 1,200 feet wide between the main breakwater and the easterly shore arm. Some of the interests concerned have suggested the advisability of narrowing this entrance with a view to securing additional protection inside. To obtain the greatest efficiency a harbor of refuge should be easily accessible under all conditions of weather, and for this reason the entrances should be as wide as possible without unduly exposing the area inclosed. For these reasons the board of is the opinion that the eastern entrance should not be less than provided for by the present project, namely, 1,200 feet. The seaward end of the shore arm breakwater being incomplete, the board believes that the direction of the part still to be constructed can be advantageously changed by building from its present outer end on a line directly toward the completed end of the main breakwater. No new estimate on account of this modification would appear to be necessary.

PROVIDENCE RIVER AND HARBOR, R. I.

Following is the report of the Board of Engineers on a recent survey, printed in House Document No. 1369, Sixty-second Congress, third session. The Chief of Engineers concurs.

BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
February 6, 1913.

The CHIEF OF ENGINEERS, UNITED STATES ARMY:

1. The survey of Providence River and Harbor, R. I., with a view to deepening the channel to 30 feet, having been made, the district officer presents herein a plan of improvement which involves dredging from deep water near North Point, Popasquash Neck, up to Fox Point, in the harbor proper, the width of channel to be 600 feet from Providence to Gaspee Point, the lower end of the present dredged channel, and 800 feet below this point, the depth throughout to be 30 feet at mean low water. The estimate for this work is as follows:

From deep water up to Sabine Point Lighthouse	$481,500
From Sabine Point to Fields Point	274,000
From Fields Point to Fox Point	341,000
Total	1,096,500

2. The importance of this harbor is indicated by the table of commercial statistics furnished, which shows that during the year 1911 35,392 vessels of a net tonnage of 6,537,123, carrying 846,383 passengers, and handling 3,888,858 tons of freight, made use of this harbor. It will be noticed that of the vessels mentioned, 36 were in foreign trade.

3. The project existing provides for dredging all of the harbor between Fox Point and Fields Point, between the east and west harbor lines, the cutting off of Fields Point back to the western harbor line, and widening the approach channel to a minimum width of 600 feet from Kettle Point to Gaspee Point; also restoring the depths in certain of the old portions of the work that have shoaled since originally dredged, the depth throughout all this work being 25 feet at mean low water. The act of 1910, which appropriated $459,000 for the prosecution of the 25-foot project, provided that no part of said sum should be expended until the Secretary of War should have received satisfactory assurances that the city of Providence or other local agencies would expend on the improvement of the harbor front an equal sum. Such assurances have been given and accepted, and the work of the United States is now nearing completion.

4. The district officer reports that the proposed deepening of Providence River and Harbor to 30 feet is advisable and worthy of being undertaken by the General Government, but only upon a basis of cooperation with local and private interests as follows:

The dredging of the deep-water harbor proper to 30 feet and its subsequent maintenance to be provided for by local and private interests.

Estimated cost	$341,000
Annual cost of maintenance	10,000

The deepening to 30 feet and any other improvement of that part of the approach channel between Fields Point and Sabine Point Light to be done jointly by the Government and the local and private interests, upon plans to be approved by the United States, the United States to contribute—

For improvement	$137,000
For maintenance annually	2,500

The above sums being one-half of the present estimated cost for these purposes, respectively.

The deepening of that portion of the approach channel from Sabine Point Light to North Point to 30 feet and its maintenance to be done wholly at the expense of the United States.

Estimated cost	$481,500
Annual cost of maintenance	10,000
Total for the United States:	
Improvement	618,500
Maintenance per year	12,500
Total for local interests:	
Improvement	478,000
Maintenance per year	12,500

5. The division engineer concurs in the opinion of the local officer that Providence Harbor is worthy of improvement. He also concurs in the opinion that the work should be done on a basis of cooperation with local and private interests; but he believes that such cooperation should take the form of local interests providing suitable areas for depositing the dredged material to the south of Fields Point in the present shoal water, protecting such area by suitable bulkheads, and paying for any necessary rehandling of materials.

6. From its study of this subject it appears to the board that the importance of this harbor from a commercial and navigation standpoint is sufficient to justify such additional work as may be necessary to meet the reasonable demands of commerce and that the probability of its extensive use by foreign as well as deep-draft coastwise vessels is sufficiently encouraging to warrant the adoption of a depth of 30 feet. Believing that the width of 600 feet proposed for the channel above Gaspee Point would be sufficient also for the channel below, the board secured from the district officer an estimate for such a width, in the sum of $312,800, as compared with his estimate of $481,500 for the 800-foot channel. Adopting this revised estimate reduces the total cost of the improvement proposed to $927,800, the estimate for maintenance being $25,000.

7. In reference to the matter of local cooperation the board believes that the large expenditures now in progress and to be made by the State and city in the matter of providing public terminal facilities, involving a total of over $2,000,000, as stated in the accompanying letter from the State harbor improvement commission, will constitute a sufficient amount of cooperation in so far as the improvement now under consideration is concerned. It would appear advisable to adopt the suggestion of the division engineer with reference to the deposit of dredged material on shallow areas near the city of Providence in lieu of towing it long distances to the present dumping grounds, if plans therefor can be arranged with local interests whereby the cost of the work to the United States will be reduced or at least will not be increased.

8. After due consideration, therefore, the board reports that in its opinion it is advisable for the United States to undertake the further improvement of Providence Harbor to a depth of 30 feet, to include a channel of approach 600 feet in width, and the dredging of the main harbor south of Fox Point, following generally the lines laid down in the project proposed by the district officer, at a total estimated cost of $927,800 and $25,000 annually for maintenance. It recommends an initial appropriation of $300,000, succeeding appropriations to be made with a view to completing the work in three years.

9. In compliance with law the board reports that except as contemplated by the above recommendations there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interest of navigation.

For the board:

Lansing H. Beach,
Lieuteuant Colonel, Corps of Engineers, Senior Member Present.

Following is the conclusion of the letter of the Chief of Engineers:

After due consideration of the above-mentioned reports I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors as to the worthiness of the work, and with the Board of Engineers for Rivers and Harbors as to the extent of local cooperation, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvemeny by the United States of Providence River and Harbor, R. I., with a view to deepening the channel to 30 feet is deemed advisable so far as to secure an available harbor or channel depth of 30 feet and a channel width of 600 feet increased at entrances and on curves at an estimated cost of $927,800 for first construction and $25,000 annually for maintenance, these estimates being based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of $300,000 and subsequent appropriations of about $325,000 per year for two years, no work in the harbor proper north of Fields Point to be done until the Secretary of War is satisfied that the State and city shall have completed their proposed expenditures in the combined Providence and Pawtucket harbors up to at least $2,000,000 for public harbor terminals or other permanent public harbor improvements.

W. H. Bixby,
Chief of Engineers, United States Army.

NEW HAVEN HARBOR, CONN.

New Haven Harbor is located on the northerly side of Long Island Sound, about 71 miles to the eastward of New York Harbor. It consists of a bay about 4 miles long and from 1 to 4 miles wide, and of the tidal portion of three streams entering into the bay. These streams are, the West River, on the westerly side, and the Mill and Quinnipiac Rivers, emptying into the northeasterly corner of the bay through a common mouth. In its natural condition the upper portion of the bay is shallow. In the lower or outer portion depths from 12 to 25 feet are found.

The volume of commerce received and shipped immediately adjacent to this comparatively restricted waterway amounted to 1,382,906 short tons during the calendar year 1911, and additional commerce amounting to 478,431 short tons passed through the channel en route to Mill and Quinnipiac Rivers. On account of the narrowness of the channel and the congestion of traffic, great difficulty is experienced in maneuvering and berthing vessels at the adjacent wharves.

Following is the letter of the Chief of Engineers submitting report on a recent survey, printed in House Document No. 1258, Sixty-second Congress, third session:

War Department,
Office of the Chief of Engineers,
Washington, January 7, 1913.

From: The Chief of Engineers.
To: The Secretary of War.
Subject: Preliminary examination and survey of New Haven Harbor, Conn.

1. There are submitted herewith, for transmission to Congress, reports dated October 14, and December 11, 1912, with map, by Maj. G. B. Pillsbury, Corps of Engineers, on preliminary examination and survey, respectively, of New Haven Harbor, Conn., called for by the river and harbor act approved July 25, 1912.

2. Under the approved project for improvement of New Haven Harbor, a channel has been provided 20 feet deep and 400 feet wide from Long Island Sound to the canal dock, thence of the same depth and 300 feet wide to Tomlinsons Bridge, and certain anchorage basins and auxiliary channels have been dredged. The district officer states that the depth has proven adequate for the character of commerce utilizing this port, but on account of the narrowness of the channel and the congestion of traffic in the upper part of the harbor great difficulty is experienced in maneuvering and berthing vessels at the adjacent wharves. To remedy this difficulty, he recommends that the 20-foot channel be widened from the 20-foot anchorage basin to Tomlinsons Bridge, as shown on the accompanying tracing, at an estimated cost of $202,000. The division engineer concurs in this recommendation.

3. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to the board's report herewith, dated December 23, 1912, concurring with the views of the district officer.

4. After due consideration of the above-mentioned reports I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of New Haven Harbor, Conn., is deemed advisable so far as to secure an available depth of 20 feet in the area of the upper harbor indicated on the accompanying tracing, at an estimated cost of $202,000 for first construction and the amount necessary annually for maintenance, this estimate being based on the supposition that the work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of $80,000 and subsequent appropriation of about $60,000 per annum.

W. H. Bixby,
Chief of Engineers, United States Army.

FLUSHING BAY, N. Y.

Report on the present project, now practically completed, may be found on page 57 of this volume. This includes a table of commercial statistics.

Following is the letter of the Chief of Engineers submitting report on a survey covering the new project printed in House Document No. 1333, Sixty-first Congress, third session:

War Department,
Office of the Chief of Engineers,
Washington, January 27, 1911.

Sir: I have the honor to submit herewith, for transmission to Congress, reports dated July 26, 1909, and March 23, 1910, with map, by Col. W. M. Black, Corps of Engineers, on preliminary examination and survey, respectively, called for by the river and harbor act approved March 3, 1909, of Flushing Bay, N. Y., with a view to securing increased depth to the head of navigation.

The existing project provides for making and maintaining a channel 6 feet deep at mean low water up to the lower bridge at Flushing and for the construction of a dike 4,663 feet long on the west side of the channel to protect it from filling. This project has been practically completed. The existing channel is of project depth, 200 feet wide up to Broadway Bridge, except at a small shoal below the above-mentioned Broadway Bridge; thence to Main Street Bridge 100 feet wide. The whole of the dike is in bad condition, and all of the outer 1,606 feet, with the exception of a few scattering piles and stones, has been carried away by storms and ice. Where not directly protected by the dike the channel in the bay has always deteriorated after being dredged.

The district officer now presents a plan of improvement which consists in the excavation of a channel of sufficient depth and width from the channel in East River to the head of navigation, 1 mile above Strongs Causeway Bridge, as follows:

"(*a*) Excavating a channel 10 feet deep at mean low water and 200 feet wide from the 10-foot contour in East River, through the bay, and up to the Broadway Bridge, at an estimated cost of $95,000 and $3,000 annually for maintenance.

"(*b*) Modifying the present dike by removing the section Z–X, repairing the sections A–Z and X–B, reconstructing section B–C, constructing the section A–E, which connects the south end of the dike with the shore, and constructing the wing X–Y to afford communication with the west side of the bay, omitting for the present the construction of the northward extension C–D, the entire structure as altered to have an elevation of 9 feet above mean low water, all at an estimated cost of $112,000 and $1,500 annually for maintenance.

"(*c*) Excavating a channel 7 feet deep at mean low water, tapering from 200 feet to 100 feet in width between Broadway Bridge and the head of navigation, at an estimated cost of $105,000 and $4,000 annually for maintenance."

The entire improvement is estimated to cost $312,000 and $8,500 annually for maintenance after completion.

The district officer believes that, although existing commerce in the portion of the creek above Main Street Bridge does not justify a large expenditure for improvement of that section, it is advisable to undertake the work now for two reasons: First, the right of way for a needed straightening of the channel can be obtained without cost to the General Government by cooperating with the city and locating the new channel to conform with a proposed street system already planned; second, material excavated from the new channel can be wasted in filling adjacent low areas, making the cost of dredging about one-third what it would be if material is towed to a distant dumping ground, as would be necessary in case owners of these adjacent properties should carry out improvements now contemplated and fill the low areas from other sources.

This report has been referred, as required by law, to the Board of Engineers for Rivers and Harbors for consideration, and the board, through a committee of its members, has held a public hearing in New York City. After consideration of all the facts available, the board concurs in the conclusion of the district officer, so far as the improvement up to Main Street Bridge is concerned, and recommends that this work be undertaken by the United States as proposed by the district officer, at an estimated cost of $235,700 and $5,500 annually for maintenance. But the board does not believe that the present and prospective commerce will justify the undertaking of the work above Main Street Bridge at the present time, and therefore does not recommend this portion of the improvement. It believes, however, that should the work above this bridge be undertaken at any time, either by the United States or other interests, it should be along the lines shown in the accompanying plans.

I concur in the opinion and recommendation of the Board of Engineers for Rivers and Harbors that this locality is worthy of improvement up to Main Street Bridge only, at an estimated cost of $235,700 and $5,500 annually for maintenance after completion.

Very respectfully,

W. H. Bixby,
Chief of Engineers, United States Army.

The Secretary of War.

HARBOR OF REFUGE AT CAPE LOOKOUT, N. C.

Cape Lookout is the middle one of the three prominent capes on the coast of North Carolina. A triangular-shaped area of beach projects into the ocean in a southerly direction for about 3 miles and forms the cape. This area is connected with the general line of the coast by a narrow neck of land on the eastern side of the triangle, and the body of water extending behind the western point of the triangle, called Western Point, forms the harbor of Lookout Bight. Vessels drawing not over 15 feet can enter.

Beaufort Harbor is the nearest harbor of importance, and is 8 miles to the westward. From Cape Lookout to the mouth of the Cape Fear River is 120 miles to the southwest. Norfolk is about 180 miles to the north.

The present and only project adopted by the river and harbor act approved July 25, 1912, provides for the construction of a harbor of refuge inclosing 575 acres of 30 feet or more in depth, in accordance with report printed in House Document No. 528, Sixty-second Congress, second session, or such modification of the plan contained in said report as may be deemed advisable after examination and survey, at an estimated cost of $3,526,600.

Amount required to be appropriated for completion of existing project...	$3,226,600
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	1,100,000

Following are extracts from the report of the Board of Engineers in the above-mentioned document:

The two vital questions in determining the advisability of a harbor of refuge are, first, the necessity for such a harbor, and, second, the choice of location. Special efforts have been made by the board to solve these questions. It issued circular letters to all the principal navigation and trade associations, coastwise steamship lines, vessel owners, etc., between Boston and New Orleans, requesting their views as to the best location for a harbor of refuge on the coast of North Carolina, made an inspection of Cape Hatteras and vicinity on October 11, 1911, of Cape Lookout on November 7, 1911, and on the latter date held a duly advertised hearing in the town of Beaufort, N. C., which was attended by a large number of interested persons, including representatives of maritime interests from Boston and New York who were delegated to appear before the board in connection with this matter. It appears from data in hand that of 226 masters of vessels, 190, or 84 per cent, advocate Cape Lookout in preference to Cape Hatteras, and that maritime interests other than ship masters are practically unanimous in favor of Cape Lookout. A representative of 22 steamship companies, involving practically all the south Atlantic coastwise steamship business, appeared before the board in favor of Cape Lookout. In addition, boards of trade, chambers of commerce, maritime exchanges, boards of underwriters, insurance companies, and others interested in the general commerce of the country, and particularly in the maritime commerce to the number of 45, are on record as favoring Lookout. Expressions of opinion favoring Hatteras are practically confined to a few individual masters of vessels.

* * * * * * *

The board concurs with the district officer and the division engineer in the opinion that the construction of a harbor at Cape Lookout for commercial purposes alone is not warranted, but it believes that the establishment of a harbor of refuge is advisable, and that such a harbor in this locality would naturally lead to some commercial development that would add to the value of the improvement.

The estimated cost of a breakwater to form a harbor of refuge at Cape Lookout, as given by the district officer, is $3,526,600. The estimate is based upon surveys made in 1897 and 1899, and while deemed sufficient for present purposes, it is probable that actual surveys and further study regarding location, type, and dimensions of breakwater, which should be given, will somewhat alter these figures. * * *

In conclusion, the board reports that in its opinion it is advisable for the General Government to establish a harbor of refuge at Cape Lookout, N. C., at an approximate cost of $3,526,600, with the understanding, however, that further study will be given to the engineering features of the project before actual work is commenced. It is recommended that the sum of $500,000 be made available in the first appropriation, and that contract authorization be given for the balance with a view to completing the work in four years.

FANCY BLUFF CREEK, GA.

Following is the report of the Board of Engineers on a recent survey, in which the Chief of Engineers concurs, printed in House Document No. 1342, Sixty-second Congress, third session:

Board of Engineers for Rivers and Harbors,
January 20, 1913.

To the Chief of Engineers, United States Army:

1. Fancy Bluff Creek is a small stream emptying into South Brunswick River about 5½ miles from Brunswick. The creek heads within a short distance of Little Satilla River, with which it has been connected by a small cut, at an expense of $2,500 contributed by Glynn County. Through this channel considerable commerce and a large number of passengers are carried on small boats, which can now operate

only on the tides. The improvement desired is the enlargement of the cut and such deepening of the upper part of the creek as may be necessary.

2. A survey having been made, the district officer, who is also division engineer, presents a plan of improvement for a channel 4 feet deep at ordinary low tide and 50 feet bottom width, estimated to cost $8,000. He states that the cost of maintenance would be very small, if anything at all, and that he is of opinion that the waterway is worthy of improvement.

3. It appears that local interests found this waterway of sufficient importance to justify an expenditure by them of $2,500, and, as it saves about 16 miles in distance and is more sheltered than the outside route, it is used even in its poor navigable condition by a large number of boats engaged in traffic between Brunswick and Little Satilla River.

4. In view of the probable small maintenance charge, the board believes the cost of improvement is not unreasonable when compared with anticipated benefits, and it therefore concurs in the views of the district officer and reports that in its opinion it is advisable for the General Government to undertake the improvement of Fancy Bluff Creek, connecting Turtle River and Brunswick Harbor with Little Satilla River, Ga., by the provision of a channel 4 feet deep and 50 feet bottom width, at an estimated cost of $8,000, all of which should be made available in one appropriation.

5. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board.

Wm. T. Rossell,
Colonel, Corps of Engineers,
Senior Member of the Board.

SAVANNAH RIVER AT AUGUSTA, GA.

Following is the letter of the Chief of Engineers submitting report on a recent survey, printed in House Document No. 1319, Sixty-second Congress, third session:

War Department,
Office of the Chief of Engineers,
Washington, January 29, 1913.

From: The Chief of Engineers.
To: The Secretary of War.
Subject: Preliminary examination and survey of Savannah River at Augusta, Ga.

1. There are submitted herewith, for transmission to Congress, reports dated November 30 and December 27, 1912, by Col. Dan C. Kingman, Corps of Engineers, on preliminary examination and estimate of cost of improvement, respectively, of Savannah River at Augusta, Ga., with a view to determining what improvements are necessary in the interest of navigation by way of enlarging and extending the project authorized by the river and harbor act approved June 25, 1910, called for by the river and harbor act approved July 25, 1912.

2. The present project for the improvement of this locality, adopted by the act of June 25, 1910, provides for protecting from erosion the bank of the river for a distance of 7,900 feet between Hawks Gully and the steamboat landing at Fifth Street, in the city of Augusta, at an estimated cost of $250,000, contingent upon the contribution of one-half of this sum by local interests. The necessary funds were furnished by the city, and the work is about three-fourths completed. The plan provides for protection of the bank up to the 25-foot contour on the Augusta gauge. The work now desired is the extension of the protective work up to the crest of the bank and downstream to East Boundary Street. For this improvement the district officer submits the following estimate of cost:

For extension of bank protection to East Boundary Street, work to be similar to existing plan	$120,000
For extending pavement up to crest of the bank over work now authorized	91,000
For extending pavement to crest of the bank for proposed new work	23,500
Total	234,500

The work is of a character to require very little maintenance under normal conditions, and no estimate of the cost of maintenance is submitted. The district officer believes that the work outlined is desirable under the condition that the city of Augusta pay one-half the cost

3. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, and attention is invited to its report herewith, dated January 14, 1913. After consideration of all information available the board has reached the conclusion that the extension of the protective work from Fifth Street to East Boundary Street to a height of 25 feet on the Augusta gauge, at a total estimated cost of $120,000, is advisable on the condition that one-half of this cost be contributed by the city of Augusta or other local interests. The board does not believe that it is advisable for the United States to extend the existing or proposed pavement up to the crest of the bank, believing that the benefits from such work would accrue almost entirely to local interests and but little, if any, to general commerce and navigation.

4. After due consideration of the above-mentioned reports, I concur in general with the views of the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of Savannah River at Augusta, Ga., is deemed advisable to the extent of extending the bank protection work from Fifth Street to East Boundary Street, Augusta, to a height of 25 feet on the Augusta gauge, at an estimated cost of $120,000 for first construction, provided $60,000 be contributed by the city of Augusta or other local interests, this estimate being based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of $60,000, being the full share of the cost of the work to be borne by the United States under the recommended plan of cooperation.

W. H. Bixby,
Chief of Engineers, United States Army.

ST. AUGUSTINE HARBOR, FLA. (ANASTASIA ISLAND).

Letter from the Chief of Engineers transmitting reports on preliminary examination and survey of St. Augustine Harbor, Fla., with a view to constructing the necessary sea walls, and also to providing a channel 16 feet deep and 300 feet wide from the city of St. Augustine to the ocean. (H. Doc. No. 580, 62d Cong., 2d sess.)

War Department,
Office of the Chief of Engineers,
Washington, February 23, 1912.

Sir: I have the honor to submit herewith for transmission to Congress, reports dated April 1, 1909, and June 8, 1911, with map, on preliminary examination and survey, respectively, called for by the river and harbor act approved March 3, 1909, of St. Augustine Harbor, Fla., with a view to constructing the necessary sea walls and also to providing a channel 16 feet deep and 300 feet wide from the city of St. Augustine to the ocean.

For reasons given in his report on preliminary examination, the district officer states that improvement of this locality to the extent of providing the 16-foot channel specified in the act is not worthy of being undertaken by the United States. In his report on survey the district officer estimates that the cost of repairing and extending existing groins on the ocean front of Anastasia Island would be $15,000, and he believes that effective protection of the inner harbor can be secured only by an extensive and costly project, which the present commercial importance of the harbor does not justify.

The division engineer favors the repair of the groins estimated by the district officer to cost $15,000, but this opinion is not concurred in by the Board of Engineers for Rivers and Harbors, to whom these reports were referred, as required by law.

After due consideration of the above-mentioned reports, I concur in general with the views of the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report that the improvement by the United States of St. Augustine Harbor, Fla., in the manner apparently desired by the interests concerned, as described in the reports herewith, is not deemed advisable at the present time in the interest of navigation, although the shore protection of Anastasia Island by groins, at a cost of $15,000 seems probably desirable as a protection to the property interests most directly concerned, one of which is the United States Lighthouse Department.

Very respectfully,

W. H. Bixby,
Chief of Engineers, United States Army.

The Secretary of War.

HOUSTON SHIP CHANNEL, TEX.

The existing project, adopted in 1899 (Annual Report of the Chief of Engineers for 1898, p. 1515, and H. Doc. No. 99, 55th Cong., 2d sess.), as modified in 1905 (Annual Report of the Chief of Engineers for 1905, p. 1495 et seq.), and Rivers and Harbors Committee Document No. 35, Sixty-first Congress, second session, is as follows:

For completing channel to head of Long Reach, including turning basin 600 feet in diameter, 25 feet deep, side slopes 1 on 2, division 1 (bay), 1 on 3 in divisions 2 and 3 (river), least radius 2,500 feet, 150 feet on bottom in division 1 (bay), 100 feet on bottom in divisions 2 and 3 (river)	$3,170,000
26,000 feet of dike revetment	40,000
1 hydraulic dredge	150,000
Engineering and contingencies (about 10 per cent)	340,000
Total	3,700,000
Amount available Dec. 1, 1904	150,000
Balance required	3,550,000

The river and harbor act of June 25, 1910, placed the work under continuing-contract appropriations, the total authorization, including an appropriation of $300,000 made in the act, being $2,500,000, providing—

"That the sum of one million two hundred and fifty thousand dollars, being one-half of the amounts herein appropriated and authorized to be appropriated, shall be furnished for the work by the 'Harris County Houston Ship Channel Navigation District,' a local organization created and existing under and by virtue of the laws of the State of Texas; and no part of the appropriation herein made shall be available for expenditure, and no contract shall be entered into under the foregoing authorization, until the Secretary of War shall be satisfied that the said navigation district has made provision for furnishing the whole of said sum of one million two hundred and fifty thousand dollars, and has placed to his credit, and subject to his order, in a United States depository, to be designated by him, three hundred thousand dollars thereof, and has satisfied him that the remainder of said sum will be deposited, in like manner, from time to time, as appropriations for the work may be made by Congress, and in amounts equal to those so appropriated: *Provided further*, That any contract entered into by the Secretary of War under the foregoing authorization shall specifically provide for the completion of the project, and that not more than one-half of the consideration agreed upon shall be furnished and paid by the United States."

The balance of the authorization remaining to be appropriated by the Government is $950,000.

In the election of January 11, 1911, "the Harris County Houston Ship Channel Navigation District," Harris County, Tex., was authorized to issue bonds for $1,250,000.

Bonds have been issued and $300,000 deposited to the order of the Secretary of War.

During the year resurvey of the ship channel was begun preparatory to dredging under the new project. Contract for dredging under the above authority was entered into and work started, 38,648 cubic yards of material being removed before the end of the fiscal year. The cost for the year was $11,402.49, principally for surveying and laying out the work.

The amount expended on the existing project up to the close of the fiscal year ending June 30, 1912, was $2,224,910.34, of which $320,631.66 was for maintenance; the portion derived from miscellaneous sources, such as sales, etc., is $352.69.

The proportion of the approved project completed up to June 30, 1912, is about 50 per cent. The entire channel has been dredged to a depth of 18½ feet, but, owing to shoaling, the maximum draft that can be carried June 30, 1912, at mean low tide is, from Bolivar Channel to Red Fish, 9.7 feet; thence to Morgans Point, 9 feet; thence to the turning basin, 10 feet; thence to foot of Main Street, Houston, 6.5 feet.

The usual variation of level of water surface is, division 1 (bay division), lower bay, 1.3 feet; upper bay, 0.5 foot; and divisions 2 and 3 (river divisions), less than one-half foot. In times of flood rises of 12 or more feet occasionally occur in Buffalo Bayou.

The total length of the improved channel is 57 miles, 50 miles to the turning basin and 7 miles farther to Houston.

The amount and value of the commerce transported is as follows:

Year.	Short tons.	Value.	Year.	Short tons.	Value.
Calendar year—			Fiscal year—		
1911	1,354,897	$34,721,530	1904-5	106,135	$17,225,993
1910	1,371,650	39,155,357	1903-4	111,840	18,350,133
1909	1,214,904	36,097,560	1902-3	109,704	15,812,632
1908	602,734	28,318,621	1901-2	141,130	21,038,677
1907	452,463	24,466,730	1900-1901	154,459	19,630,640
1906	132,108	No value.			
1905	104,907	12,544,323			

The bulk of the tonnage is cotton, amounting last calendar year to 97,247 short tons, valued at $23,338,280, which is carried on barges to Galveston and there loaded on vessels.

The effect of this project on freight rates is unknown and is indeterminate because of a railroad rate differential in favor of Houston, authorized by the railroad commission of the State of Texas.

The amount required for expenditure in the fiscal year ending June 30, 1914, will be applied to forming the 25-foot channel.

July 1, 1911, balance unexpended	$352,804.17
Proceeds of sales of contact prints	21.95
	352,826.12
June 30, 1912, amount expended during fiscal year for works of improvement	10,082.72
July 1, 1912, balance unexpended	342,743.40
July 1, 1912, outstanding liabilities	9,970.62
July 1, 1912, balance available	332,772.78
Amount of continuing contract authorization, act of June 25, 1910	1,250,000.00
Amount appropriated under such authorization	300,000.00
Amount yet to be appropriated	950,000.00
Amount (estimated) required to be appropriated for completion of existing project	[1] 950,000.00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[1] 550,000.00

LAKE CRESCENT AND DUNNS CREEK, FLA.

War Department,
Office of the Chief of Engineers,
Washington, January 30, 1913.

From: The Chief of Engineers.
To: The Secretary of War.
Subject: Preliminary examination and survey of Lake Crescent and Dunns Creek, Fla., from the St. Johns River to Crescent City.

1. There are submitted herewith, for transmission to Congress, reports dated September 26, 1911, and July 10, 191, with maps, by Capt. J. R. Slattery, Corps of Engineers, on preliminary examination and survey, respectively, of Lake Crescent and Dunns Creek, Fla., from the St. Johns River to Crescent City, called for by the river and harbor act approved June 25, 1910.

2. Dunns Creek is a connecting waterway between Crescent Lake and the St. Johns River, which it enters 7 miles above Palatka. It has a depth of about 12 feet, but there are several sharp bends which render navigation difficult. Crescent Lake has generally a similar depth, but near the entrance to Dunns Creek is a shoal having a depth of only about 6 feet. Dunns Creek and Lake Crescent lie in the drainage area of St. Johns River, which flows in a northerly direction a distance of 62 miles from the mouth of Dunns Creek to Jacksonville and then in an easterly direction a dis-

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[1] Exclusive of the balance unexpended July 1, 1912, and to be furnished by local authorities.

tance of 27.5 miles, emptying into the Atlantic Ocean. The controlling depth in St. Johns River is in excess of the depths recommended for Dunns Creek and Lake Crescent.

3. The district officer in his report on the survey submits a project for providing a channel with a depth of 10 feet and 100 feet wide at an estimated cost of $32,000, but in a supplemental report dated September 4, 1912, and forwarded herewith, he states that a channel 8 feet deep would provide for most of the existing boats. The cost of an 8-foot channel with three cut-offs, as suggested by the Board of Engineers for Rivers and Harbors, is estimated by him in a letter dated December 24, 1912, at $24,954. He believes that the improvement as thus modified is justified by present and prospective commercial interests, and in this opinion the division engineer concurs. The district officer also submits an estimate for a channel 6 feet in depth into Dead Lake at the upper end of Lake Crescent, but consideration of this improvement does not appear to be authorized by the wording of the act.

4. These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, to whose accompanying report of January 6, 1913, attention is invited. It is stated by the board that the information available indicates that the country is rapidly developing and that a moderate increase in commerce may be expected in the near future if suitable navigation facilities are provided. In connection with its consideration of the case, the board held a hearing in its office on December 9, 1912, and after consideration of all data available expresses the opinion that it is advisable for the United States to undertake the improvement of the locality under the modified project for a channel 8 feet deep and 100 feet wide, from St. Johns River into Lake Crescent, including three cut-offs, at a total estimated cost of $25,000 for original work and $1,000 annually for maintenance.

5. After due consideration of the above-mentioned reports I concur in general with the views of the district officer, the division engineer, and the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of Lake Crescent and Dunns Creek, Fla., from the St. Johns River to Crescent City, is deemed advisable so far as to secure an available channel depth of 8 feet and a channel width of 100 feet, including the three cut-offs, following in general the methods described in the reports of the district officer as modified by the Board of Engineers for Rivers and Harbors at an estimated cost of $25,000 for first construction and $1,000 annually for maintenance, these estimates being based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of the entire estimated cost of the improvement; the improvement to be made contingent upon the donation free of cost to the United States of the rights of way necessary for the proposed cut-offs.

W. H. Bixby,
Chief of Engineers, United States Army.

CHANNEL BETWEEN ST. JOHNS RIVER AND CUMBERLAND SOUND, GEORGIA AND FLORIDA.

Following are extracts from report on a recent examination, printed in House Document No. 898, Sixty-second Congress, second session:

War Department,
Office of the Chief of Engineers,
Washington, August 2, 1912.

Sir: I have the honor to submit herewith, for transmission to Congress, reports dated July 12, 1911, by Capt. George R. Spalding, Corps of Engineers, and November 7, 1911, by Capt. J. R. Slattery, Corps of Engineers, on preliminary examination, with plan and estimate of cost of improvement, respectively, of the channel between the St. Johns River, Fla., and Cumberland Sound, by way of the Sisters Creek out of the St. Johns River, with a view to straightening and deepening the channel, authorized by the river and harbor act approved February 27, 1911.

This is an existing waterway by which light-draft navigation between Cumberland Sound and St. Johns River is practicable. The route is, however, narrow and tortuous in places and of insufficient capacity for an extensive traffic. Nevertheless this waterway is used considerably and the improvement desired is an enlarged and straightened channel to meet the growing demands of commerce.

The district officer estimates the cost of a channel following the natural route with some widening and straightening of the channel by means of cut-offs where imperative, as follows: 100 feet wide on bottom, and 7 feet deep, at $101,000, and 10 feet deep, at $182,000, the cost of annual maintenance in either case being $1,000. Such a channel following the route proposed for the intracostal waterway and 10 feet deep is estimated to cost $437,000, and $1,500 annually for maintenance. The district officer recommends the 10-foot channel along the line of the proposed intracostal waterway, if that project is to be undertaken, or along the natural route, if it is decided not to undertake the general intracostal canal project. The division engineer favors the route selected by the intracostal waterway board even though its depth be reduced to 7 feet.

These reports have been referred, as required by law, to the Board of Engineers for Rivers and Harbors, to whose report dated December 26, 1911, attention is invited. After a careful consideration of this improvement, the board is of opinion that the benefits to be expected from such a channel will be commensurate with the expenditure required for the natural route but that the increased cost required to follow the route of the proposed intracoastal waterway would not be justified. It therefore recommends the adoption of the project for a channel 7 feet deep and 100 feet wide on bottom along the natural route at an estimated first cost of $101,000, and $1,000 annually for maintenance.

After due consideration of the above-mentioned reports I concur in general with the views of the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of the channel between St. Johns River, Fla., and Cumberland Sound, by way of Sisters Creek out of the St. Johns River, is deemed advisable so far as to secure an available channel depth of 7 feet and a width of 100 feet on bottom along the natural route following in general the route and methods described in the report of the district officer at an estimated cost of $101,000 for first construction and $1,000 annually for maintenance, these estimates being based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of $50,000 with a contract authorization for the balance with a view to completion of the work within two years.

Very respectfully,
W. H. BIXBY,
Chief of Engineers, United States Army.

The SECRETARY OF WAR.

The present and prospective commerce is thus summarized by Capt. Spalding:

The present commerce consists of naval stores, rafts of logs, lighters of lumber and crossties, fish, oysters, and other sea food. In addition, the waterway forms a part of an inland way from Florida north, and is used a great deal by pleasure craft bound to Florida for the winter season and returning in the spring. Dredging and other companies operating floating plants make considerable use of the channel, even though the trip through, on account of the necessity for taking advantage of full tide at many places, may occupy from four to five days.

There is unfortunately no record of passages, but the number all told is large. On a recent trip from St. Johns River to Cumberland Sound eight gasoline-power boats, one of them towing three empty lighters, were passed.

It has been difficult to arrive at accurate statistics of traffic, but the following table gives a very conservative estimate of the freight movement:

	Tons.	Value.
Naval stores	800	$55,000
Lumber, logs, ties	22,710	175,000
Oysters, canned; oyster shell	5,000	45,000
Fresh fish, oysters, and other sea food	....	12,000
Total	28,510	283,000

With a good usable channel, having a depth of not less than 12 feet at high water and of ample width, the probable percentage of increase over present tonnage has been variously estimated by conservative business men at from 400 per cent to 1,000 per cent.

The Cummer Lumber Co., one of the largest lumber firms in the South, owns 100,000,000 feet of standing cypress on Thomas and Boggie Creeks, tributaries of Nassau River, which forms part of the waterway in question. The same company controls a holding of 150,000,000 feet of pine tributary to Nassau River. Both of these tracts are practically inaccessible at present except by way of the tortuous channel. There are other large lumber tracts which could be opened up if water transportation were possible, and also large areas of agricultural lands on Nassau River and other portions of the route.

Aside from its use in developing a fine section of country lying adjacent to natural waterways which have no outlet to the sea or to ports, the proposed channel would be of very great value in handling cargo on lighters between the ocean ports of Jacksonville and Fernandina. Shippers and steamship agents operating in Florida ship out of both of these ports, and while usually the bottom cargoes are of phosphate and are loaded into ships direct from rail, the top loads are made up of miscellaneous shipments of all kinds, which are collected at either port for shipment. In case a ship bound for a certain destination enters either port the top load is more than apt to be made up of materials collected at the other port, and rail shipment between ports is necessary. The lighter shipment would not only be much cheaper, but very much more expeditious. The same transfer of top loading occurs on imports.

The value of an adequate inland waterway between the St. Johns River and Fernandina, whence one of fair dimensions already exists to Savannah and Charleston, can not, in my mind, be overestimated.

ARKANSAS RIVER, ARK., IN FRONT OF CRAWFORD COUNTY LEVEE.

The act of July 25, 1912, made an appropriation of $30,000 for protecting the north bank of the Arkansas River in the bend in front of the Crawford County Levee, south of Van Buren, in sections 8, 9, and 10, in township 8 north, range 30 west, and provided that the work be considered "extraordinary emergency work," and that the appropriation be expended as soon as practicable.

The site of this work is in Trusty Bend of Arkansas River, 14 miles below Van Buren, Ark., near the Cross Lanes settlement, where a levee built by a local levee district is in danger of being breached by reason of caving of the bank of the river.

No report of a preliminary examination or survey of this locality has been published.

The Crawford County Levee extends from the south limits of Van Buren, Ark., to near the mouth of Frog Bayou, where it joins the foothills. The length of the levee is 20.2 miles. The area embraced in the leveed territory is a little over 18,000 acres. Drainage of this leveed basin is provided for by means of culverts with automatic floodgates. During the two freshets that passed in April and May of this year (1912) the bank in the bight of Trusty Bend in section 9, township 8 north, range 30 west, receded about 450 feet, the head of the caving being about the west line of section 9 and extending a little east of the east line of section 10. In this distance 7,000 feet of the levee is less than 800 feet and 4,300 feet of it is between 500 and 330 feet from the river bank. The minimum amount of bank protection needed along this levee front is 2 miles, at an approximate cost of $50,000 a mile.

If it is the intent of Congress to fully protect the levee, $70,000 is the additional amount required to complete the minimum work needed.

There has been no expenditure on this project.

Amount appropriated by river and harbor act approved July 25, 1912	$30,000
Amount available for fiscal year ending June 30, 1913	30,000

ARCADIA HARBOR, MICH.

This harbor is distant by water about 9 miles from Portage Lake Harbor on the south and 10 miles from Frankfort Harbor on the north. The act of March 3, 1905, appropriated $6,000 for the improvement of this harbor in accordance with report submitted in House Document No. 194, Fifty-eighth Congress, second session.

While a plan was submitted for rebuilding the piers at a cost of $90,390, and annual maintenance and dredging at a cost of $5,200, the plan that was recommended and approved was for maintenance of the present channel by dredging only, at a cost of $3,000 annually for a period of five years, at the end of which time, if a growth of the commerce had been manifested such as to warrant larger expenditures, the plan for radical improvement by reconstruction of the piers could be undertaken. At the time of the survey—September, 1902—the depth was some 12 feet in a narrow and rather difficult channel, produced and maintained by repeated dredging at local expense, and this depth was subject to considerable reduction during the usual lowering of the lake surface in the months of October and April, so that only 10 feet could be safely counted on as the navigable depth. The piers terminate at the 10-foot contour.

The approved project was completed in 1909 by reason of the expiration of the authorized period of five years for maintenance by dredging. A report upon preliminary examination made under authority of the river and harbor act of 1910, and printed in House Document No. 701, Sixty-second Congress, second session, was adverse to the further improvement of the harbor.

A report on preliminary examination is published in House Document No. 132, Fifty-sixth Congress, first session, and in annual report of 1900, pages 3942–3946. Report on a survey is published in the Annual Report of the Chief of Engineers for 1904, pages 3037–3048, and in House Document No. 194, Fifty-eighth Congress, second session. Report on preliminary examination is published in House Document No. 321, Sixty-first Congress, second session, and reviewed in Rivers and Harbors Committee Document No. 10, Sixty-first Congress, second session. Report on a preliminary examination is published in House Document No. 701, Sixty-second Congress, second session.

There is no project at the present time for the improvement of this harbor, present operations being for maintenance.

The operations during the fiscal year have been dredging for maintenance to restore navigable depth between the piers and across the bar in Lake Michigan and minor repairs to piers. The dredging under special agreement was completed July 12, 1911, producing a channel about 13.5 feet deep below zero of gauge and about 50 feet wide. Dredging by the *Meade*, September 7, 8, and 13, 1911, on the entrance bar in Lake Michigan increased the depth below zero of gauge from about 14 feet to about 16 feet for a width of about 200 feet. April 26, 1912, a contract was entered into for dredging a channel 60 feet wide and 16 feet deep below zero of gauge from lake to lake and was completed June 29, 1912. Repairs by day labor and purchased material were made July 11 to August 16 and September 26 to October 10, 1911, to the portions of both piers which were in the most dilapidated and unsafe condition; the old filling was overhauled and renewed with slabs and stone filling, a few new channel piles driven, and slight repairs made to deck and supporting crossties. Soundings of May 6–8, 1912, showed available depths below zero of gauge of 14 feet on the entrance bar and 10.3 feet between the piers.

To June 30, 1912, there had been expended $20,629.04 for maintenance.

The maximum draft that could be carried June 30, 1912, was about 14.5 feet, the available depth being 16 feet below zero of gauge. The channel which requires dredging is about 2,000 feet long from lake to lake. On account of the condition of the piers and their short length the results of dredging are only temporary. The channel which requires dredging extends 700 feet beyond the outer end of the north pier, and this portion is exposed to open lake storms and is easily obliterated. Navigation extends to the village of Arcadia at the north end of North Bar Lake, which is about 4,800 feet long north and south, with depths of 20 feet or more.

The vessel commerce for this harbor in 1911 amounts to 389 arrivals and departures, with 18,455 short tons of cargo valued at $347,671, entirely local in character. The number of passengers carried in 1911 was 3,637. Definite information as to the effect of this harbor on freight rates could not be ascertained as the Arcadia & Betsie Railroad into this town does not do an interstate business.

The balance on hand and available June 30, 1912, is $3,819.63, the most of which will be required to pay for additional dredging to be done by the *Meade* in the first week of July, 1912. The river and harbor act of July 25, 1912, appropriates $15,000 for improvement and maintenance, which it is proposed to expend during the fiscal years ending June 30, 1913, and June 30, 1914, for maintenance by dredging to maintain a channel between the piers and across the bar in Lake Michigan and for temporary repairs to the piers when found necessary, as the pier structures are uniformly in such bad condition that it is not deemed advisable to spend small appropriations in constructing short lengths of new work.

July 1, 1911, balance unexpended	$9,947.54
June 30, 1912, amount expended during fiscal year, for maintenance of improvement	5,576.58
July 1, 1912, balance unexpended	4,370.96
July 1, 1912, outstanding liabilities	551.33
July 1, 1912, balance available	3,819.63
Amount appropriated by river and harbor act approved July 25, 1912	15,000.00
Amount available for fiscal year ending June 30, 1913	18,819.63
July 1, 1912, amount covered by uncompleted contracts	2,834.40

SAGINAW RIVER, MICH.

This river is formed by the junction of the Tittabawassee and Shiawassee Rivers, at the southerly limits of the city of Saginaw, flows in a northerly direction a distance of 22 miles, and discharges into the south end of Saginaw Bay. The project covers the entire length of the river and 4¾ miles in the bay. Prior to improvement the entrance to the river was obstructed by a bar in Saginaw Bay, having a minimum depth of about 9 feet at 581.63. Between the mouth and Bay City the depth varied from 15 to 30 feet. Thence to the head of the river the channel was obstructed by a number of bars having 7 feet of water.

The original project for the improvement of this river was made in 1866, and contemplated a straight channel 195 feet wide and 12 feet deep across the bar at the mouth. This was completed in 1869. In 1874 the project was extended to include the improvement of the river above Bay City. It included dredging a 10-foot channel across the bars at East Saginaw and Carrollton and the construction of a pile revetment at the latter place. Later similar improvements at Zilwaukee bar, New York Works bar, and Willow Island were added. The cost of the work under this project was $219,000.

In 1882 a project was adopted which provided for a channel 200 feet wide and 14 feet deep from Saginaw Bay to and along the front of Bay City, and thence a channel of same width, 12 feet deep, to the upper limits of the city of Saginaw, the datum plane being 581.1; estimated cost, $546,000. By the river and harbor act of August 5, 1886, the improvement of the west channel along West Bay City was also added to the project.

The amount expended on project of 1882 to June 30, 1910, is $743,558.10. In the past no attempt has been made to separate the cost of maintenance from that of original improvement, so that it is impossible now to separate these items.

The existing project, adopted by the river and harbor act of June 25, 1910, provides for a channel 200 feet wide with a depth of 18 feet from Saginaw Bay to the mouth of the river, and of 16 feet, at 581.1, from that point to the junction with the Tittabawassee River; estimated cost, $686,000, with $20,000 annually for maintenance.

The datum plane for work under this project, which has been heretofore 581.1, is from 1 to 2 feet higher than the mean surface elevation of Lake Huron during the past two years, has been changed to 579, in order to provide the channel depths called for by the adopted project.

This project is based upon report of examination and survey published in House Document No. 740, Sixty-first Congress, second session, and referred to on page 861, Report of Chief of Engineers for 1910. This report contains a map of the river.

No modification has been made in the existing project since its adoption.

The precise effect of the improvement upon freight rates can not be stated. It is undoubted, however, that freight rates, both to Bay City and Saginaw, have been materially lowered by the existence of the improved channel.

The available balance and the additional funds requested will be expended for deepening the channel in the bay to the mouth to 18 feet, from the mouth to the junction of the Tittabawassee River to 16 feet, and the necessary inspection and engineering.

July 1, 1911, balance unexpended	$345, 773. 56
June 30, 1912, amount expended during fiscal year, for works of improvement	90, 558. 63
July 1, 1912, balance unexpended	255, 214. 93
July 1, 1912, outstanding liabilities	35, 023. 95
July 1, 1912, balance available	220, 190. 98
Amount appropriated by sundry civil act approved Aug. 24, 1912	100, 000. 00
Amount available for fiscal year ending June 30, 1913	320, 190. 98
July 1, 1912, amount covered by uncompleted contracts	369, 322. 41
Amount of continuing-contract authorization, act of June 25, 1910	636, 000. 00
Amount appropriated under such authorization	400, 000. 00
Amount yet to be appropriated	236, 000. 00
Amount (estimated) required to be appropriated for completion of existing project	[1][2] 236, 000. 00
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	[2] 236, 000. 00

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[1] This is the unappropriated balance of the original estimate. On account of the lowering of the datum plane on which this estimate was based and the consequent increase in work to be done, this amount will not complete the project.

[2] Exclusive of amount available for fiscal year 1913.

The following statement was furnished the committee, on its request, by the Chief of Engineers:

The existing project for the improvement of Saginaw River, Mich., adopted by the river and harbor act of June 25, 1910, provides for an 18-foot channel from the 18-foot curve in Saginaw Bay to the mouth of the river, and a 16-foot channel thence to the junction with the Tittabawassee River. The datum plane, intended to represent mean lake level, and below which these depths were to be obtained, was adopted about 1882, and was established at 581.1 feet above mean tide at New York. Due to various causes the mean lake level for the past two years has been 1 to 2 feet below the established datum plane of 581.1 feet, thereby causing a diminution to that extent in the available depths, and in order that the project depths might be available, the datum plane was in 1912 changed to 579 feet above mean tide at New York. It is estimated that the cost of the project will be increased from $686,000 to $881,000, i. e., by $195,000 for the extra dredging caused by the lowering of the datum plane.

GRAND CALUMET RIVER, IND.

The provision authorizing the straightening of the channel of this river follows the language of Senate bill 2789, Sixty-second Congress, first session, which was favorably reported from this committee and has passed the Senate. The facts in the case are presented in the following report of the committee on the bill, submitted by Mr. Burton:

The Committee on Commerce, to whom was referred the bill (S. 2789) to change the location and straighten the course of the channel of the Grand Calumet River through the lands of the Gary Land Co. and the Indiana Steel Co., and for other purposes, having considered the same, report thereon with a recommendation that it pass without amendment.

The bill under consideration (S. 2789) provides that a change may be made in the location of the channel of the Grand Calumet River for a distance of approximately 2 miles through the lands of the Gary Land Co. and the Indiana Steel Co. in Lake County, Ind. At present this stream at and near to the location in question is entirely unsuited for purposes of navigation. It is crooked in its course and of such a slight current that no continuous or available waterway exists.

In the year 1888 a survey was made by the Corps of Engineers of the United States Army of the Grand Calumet River from a point one-half mile east of Hammond, Ind., easterly to its junction with Lake Michigan. The distance between the points named is about 13½ miles in a direct line and 15 miles along the meanders of the stream. As stated by the assistant engineer who made the survey:

"The easterly 5 miles of the stream are very irregular in all respects; the depth varies between 1 and 10 feet, with an average hardly exceeding 3 or 4 feet. The channel becomes here generally narrower with more extensive and irregular bends, occasionally widening out into an open slough, in other places becoming almost extinct to the eye or only sufficiently wide to push a small skiff through it. Through this part an improved channel would have to be made in a comparatively straight line through the marsh, as it would be impracticable to attempt to follow the original channel."

The location in question, through which it is proposed to change the alignment of the channel, is included in the easterly 5 miles above described. The condition set forth in this report has been intensified since 1888 in that obstacles in the stream have increased. At the junction with Lake Michigan a sand bank a quarter of a mile in length interposes an impassable barrier.

Acting upon the supposition that this was not a navigable stream, the Indiana Steel Co. recently constructed coke ovens and other works upon the location formerly included in the bed of the stream and substituted therefor a straight channel some 2 miles in length. It is evident that at the time this change was made that part of the stream was not navigable as there was no continuous channel even for a rowboat, and in the detached or separate bodies of water which occupied the bed of the channel the depth varied from a few inches to 10 feet or even more.

In the report referred to in 1888 Capt. W. L. Marshall, since Chief of Engineers of the United States Army, referred to this part as "a dead river, wandering from side to side in a marsh 600 to 1,400 feet in width, lying between Hammond, Ind., and its old mouth (at its junction with Lake Michigan), now closed by sand."

While this portion of the river can not at present be regarded as a navigable stream, it is quite possible, in view of the great industrial development of this locality, that improvements may be projected for the construction of a canal along the general course of the river for purposes of navigation; and should such improvement be made it is clearly evident that it would be necessary to straighten the channel, as has already been done by the Indiana Steel Co.

The occupation of the bed of the river seems to have been made on the supposition that no capacity for navigation existed along the portion of the stream where structures have been erected; but on further consideration it was thought best to have the approval of the War Department under the river and harbor act of March 3, 1899. This approval was refused on the ground that the work had been accomplished before permission was asked under the act. In the next place doubt was expressed whether consent could be given without action by Congress. It was thereupon proposed, as appears in the bill, that a strip specifically described therein should be conveyed to the United States free of cost for a free public waterway, which, with "any enlargement thereof which Congress may hereafter authorize, shall become and forever remain a free public waterway of the United States and shall be subject to the laws heretofore and hereafter enacted by Congress for the improvement, preservation, and protection of navigable waters."

It was recommended that when this condition be complied with the old channel of the river should be regarded as abandoned. This strip of land is about 2 miles in length and for most of the distance 200 feet in width, while for a part it is 150 feet in width. The right is reserved to the grantors to "occupy and use so much of said strip of land as lies outside of high-water limits of the said new channel until such time as Congress shall authorize and make provision for the enlargement, widening, or other improvement of said channel, it being understood that such occupation and use shall be for temporary purposes only," etc.

The committee regard the proposed abandonment of the old channel and the acceptance of the new as described as altogether desirable from every standpoint. Not only will the needs of prospective navigation be amply safeguarded, but it would be absolutely necessary to abandon the old channel and construct a new one along the lines provided. The utilization of the property for industrial purposes is secured by this arrangement, and ample provision is made for the future development of navigation in the locality.

A letter from the Acting Chief of Engineers is attached, stating that the bill has been carefully drawn and amply provides for the protection of the rights and interests of public navigation, present and prospective, and calling attention to the fact that the two companies which request the change own all the property along both the old and new channels.

War Department,
Office of the Chief of Engineers,
Washington, June 20, 1911.

The Secretary of War.

Sir: I have the honor to return herewith a letter, dated the 17th instant, from the Senate Committee on Commerce, inclosing for the views of the War Department thereon S. 2789, Sixty-second Congress, first session, "A bill to change the location and straighten the course of the channel of the Grand Calumet River through the lands of the Gary Land Company and the Indiana Steel Company."

In February, 1911, the Gary Land Co. and the Indiana Steel Co. made application to the department for approval of a change, already accomplished, in the location of the channel of the Grand Calumet River in Lake County, Ind., at the point shown on the accompanying blue print. The proposition involved the abandonment and filling in of the natural waterway, which is narrow, tortuous, and practically unnavigable, and the maintenance in its stead of an artificial channel capable of easy and practicable navigation. Included with the application for approval of the work was an offer to convey to the United States an easement over a strip of land, embracing the bed of the new channel, from 150 to 200 feet in width, in order that the stream might be conserved by the United States as a public navigable waterway.

As the basis for their application the companies stated (*a*) that they owned all the lands in which lie the old river and the new channel at the location, together with large bodies of adjacent lands; (*b*) that the applicants had constructed a very large steelworks in the vicinity, in connection with which it was necessary that they should occupy and use the lowlands along the river; (*c*) that these lands were chiefly swamps and marsh, necessitating their drainage and filling in to make them available for occupancy; and that as the old river was narrow, crooked, and with no well-defined channel, the required drainage and other improvement could be accomplished at reasonable cost only by dredging a new and straight channel; (*d*) that while the old river was not capable of useful navigation, and its classification as a navigable waterway of the United States was doubtful, all question on this point would be obviated by providing a new and serviceable channel in its stead.

The application was carefully considered by the department, and the conclusion was reached that, from the standpoint of navigation, the new channel presented many advantages, and that there was no apparent objection to the proposition as a whole so far as any Federal interests were concerned, but that there was no power lodged in the department to approve it in the absence of specific congressional sanction.

The applicants were accordingly advised that the work could be legalized by Congress alone, and that approval must be sought from that body. To obtain this approval is the object of the bill under consideration. The measure has been carefully drawn, and in my judgment it amply provides for the protection of the rights and interests of public navigation, present and prospective, which are apparently the only Federal interests concerned. And, inasmuch as the two companies own all the property along both the old and new channels, there appears to be no private property rights involved in the change from the one to the other.

I see no objection to the favorable consideration of the bill by Congress.

Very respectfully,

EDW. BURR,
Acting Chief of Engineers.

MISSISSIPPI RIVER BETWEEN WINNIBIGOSHISH AND POKEGAMA RESERVOIRS, AND THE LEECH RIVER FROM ITS MOUTH TO LEECH LAKE DAM, MINN.

The following report of the Board of Engineers on a recent survey is printed in House Document No. 1223, Sixty-second Congress, third session. The Chief of Engineers concurs with the views of the board.

THE BOARD OF ENGINEERS FOR RIVERS AND HARBORS,
Washington, June 24, 1912.

1. Respectfully returned to the Chief of Engineers, United States Army.

2. A survey having been made of the Mississippi River between Winnibigoshish and Pokegama Reservoirs, and from Leech Lake Dam to the mouth of Leech River, the district officer submits a project for improvement contemplating a ruling depth of about 8 feet at bank-full stage. For convenience of consideration he divides the channel into three sections, the estimated excavation and expected carrying capacity of each being as follows:

	Carrying capacity per second.	Excavation.
	Cubic feet.	*Cubic yards.*
Mississippi River above its junction with Leech River	1,500	591,111
Leech River	1,200	522,222
Mississippi River below its junction with Leech River	2,700	815,741

The district officer states that should this work be let by contract it would scarcely be possible to get a lower price than 18 cents per yard. At a normal rate of progress, the work would require about four years, and a dredge would be pretty well worn out in that time. He has therefore assumed that it would be economical for the United States to construct its own plant and do the work by hired labor. A suitable plant is estimated to cost $56,000, and with such plant it is estimated that the dredging could be done for 12 cents per cubic yard, or $240,000, making a total cost of $296,000. Annual maintenance is estimated at $15,000.

3. With the improved channel as outlined above, the district officer estimates that a discharge of 1,500 cubic feet per second from Winnibigoshish, and 1,200 feet per second from Leech Lake would produce its full effect at Pokegama in 4 or 5 days instead of 21 days, as at present, and the comparatively straight channels would considerably reduce losses by evaporation. Logs would no longer be carried over the

bottom lands and left there when the discharge was reduced. Logging operations and steamboating could be carried on at the same time with much less interference. It would no longer be necessary to flood the meadows during haymaking time, as is now done every low season to the great disadvantage of the farmers. With the better control of water between the reservoirs, the required depths could be maintained in the upper Mississippi and at St. Paul with much more certainty and with considerable saving in water. The district officer recognizes that these benefits are very great; nevertheless, he believes that they would be secured at too high a price, and therefore he feels obliged to report that this work is not worthy of being undertaken by the United States at the present time.

4. The division engineer points out that the result of the improvement will be to reduce the time required to deliver water from Winnibigoshish and Leech Lake Reservoirs to St. Paul, from 31 to 14 or 15 days, putting the center of the reservoir system about 13½ days from St. Paul instead of 27, or one-half the present time. Giving due weight to the other benefits to be anticipated from the work, he is of opinion that the proposed improvement is worthy to be undertaken by the General Government.

5. There seems to be little doubt that benefits of a substantial character will be realized from the improvement, and this fact is recognized by both the district officer and division engineer. The work proposed is supplementary to the project for construction and operation of reservoirs at the headwaters of the Mississippi River, on which about $2,000,000 have already been expended, and it should aid appreciably in accomplishing the results for which that project was designed, though it is questioned whether the reduction in time of flow will be as great as it is estimated by the district officer. In view of this and other benefits to be derived from the work, the board joins the division engineer in expressing the opinion that it is advisable for the United States to undertake the project outlined within, at an estimated cost of $296,000 and $15,000 for annual maintenance. The initial appropriation should be $116,000.

6. There are no questions of terminal facilities, water power, or other related subjects which could be coordinated with the work proposed in such manner as to lessen its cost and compensate the Government for expenditures made in the interests of commerce and navigation.

For the board:

Wm. T. Rossell,
Colonel, Corps of Engineers, Senior Member of the Board.

MISSISSIPPI RIVER, MINN., HYDROELECTRIC POWER.

Following is the letter of the Chief of Engineers submitting the report of a special board of engineer officers on an examination of the Mississippi River between St. Paul and Minneapolis "with a view to modification of project to provide for increased depth and utilizing the surplus water for development of power," printed in House Document No. 741, Sixty-first Congress, second session:

War Department,
Office of the Chief of Engineers,
Washington, March 3, 1910.

Sir: The river and harbor act of March 3, 1909, provides for an examination of "Mississippi River, from St. Paul to Minneapolis, with a view to modification of project to provide for increased depth and utilizing the surplus water for development of power."

The duty of making this examination was committed to a special board of officers of the Corps of Engineers, whose full and comprehensive report thereon I have the honor to submit herewith for transmission to Congress.

The present approved project for the improvement of the Mississippi River between St. Paul and Minneapolis provides for the construction of two locks and dams and for securing a depth of 6 feet at low water. The depth originally projected was 5 feet at low water, but was increased to 6 feet by the river and harbor act of March 2, 1907, which necessitates some changes in the original plans for the locks and dams. Lock and Dam No. 2 has been completed and is now in use, and Lock No. 1 has also been built, but the dam at the latter is yet to be constructed. To secure the increased project depth of 6 feet it is proposed to use flashboards at Dam No. 2, to raise Dam No. 1 about 1 foot, and to construct an auxiliary lock of small lift below Lock No. 1 for use at extreme low water. The board is of the opinion that a depth of 6 feet at low water is sufficient for the present needs of commerce; consequently further modification of the project will be unnecessary if existing commerce alone is to be provided for.

The development of water power, however, if added to the scheme of improvement will necessitate further changes from the present plans, as the two dams, if completed as originally projected, with 13-foot lifts, will not be adequate for this purpose. The board believes, however, that by building Dam No. 1 (which has not yet been commenced) with a lift of 30 feet, ample provision would be made for the economical development of water power to the extent of about 15,000 horsepower. To build such a dam and raise the lock, would cost about $200,000 more than to complete the present project as planned, with a low dam at Lock 1, assuming the cities of St. Paul and Minneapolis grant flowage easement over their lands, and in view of the fact that the cheaper plan will, when constructed, carry out the project adopted by Congress for a 6-foot waterway, the board feels that the legality of this additional expenditure by the United States, although affording improved facilities for navigation, is not free from doubt in so far as it may be considered as for the purpose of water-power development. While the board does not recommend that the construction of a single high dam be undertaken by the United States alone, it is convinced that the change from a low to a high dam would be of great benefit, and that it should be carried out now in cooperation with State or municipal agencies. To this end the board has been in conference with representatives of the cities of St. Paul and Minneapolis, who have expressed a willingness to cooperate with the United States and to bear the increased cost of the scheme.

This proposition is fully discussed in the report, and as a result of thorough consideration the board recommends that specific legislation be enacted to carry it out.

The Board of Engineers for Rivers and Harbors has reviewed the conclusions and recommendations of the special board and concurs in the proposition for municipal cooperation and for the necessary legislation as advanced by said board, with one or two minor exceptions. It is also of opinion that lowering the floor and miter sill of the existing lock, even at additional cost, is preferable to the construction of an auxiliary lock. The additional cost has been estimated at approximately $30,000.

There is no question that a single dam with a lift of approximately 30 feet would have many advantages over the present system of two locks and dams. It would give a depth of 9 feet at the head of navigation at Minneapolis, which would probably meet the needs of all future navigation; it would be easier and cheaper to maintain and operate; would provide better facilities for the passage of vessels; and would create a valuable water power which could be utilized to pay the cost of construction as well as of future maintenance and operation, and produce a perpetual surplus revenue for the Government.

Furthermore, I am convinced that the construction of such a lock and dam by the Government alone is feasible, practicable, and legal under existing conditions. It is true that the existing project has been partially completed, and when completed will suffice for the present needs of navigation; but there is no assurance that this project will not need considerable further enlargement for navigation purposes within a few years. As a matter of fact, it has already been enlarged once since its original adoption, and no one can say with certainty that a depth of 7, 8, or even 9 feet will not be actually demanded in the near future. It is not unusual for Congress to provide for reasonably prospective, as well as for existing commercial needs, and in many cases where it was not provided for it would have been wise, as well as economical, to have done so.

To make such a change in the project now will entail an additional expense of $230,000, including all flowage rights except those owned and controlled by the cities of St. Paul and Minneapolis, and at no time in the future can it be accomplished so economically. This additional expenditure can be recovered in a short time from the utilization of the water power which would be incidentally created. Moreover, the creation of water power at this locality would be of special advantage to Governmental interests other than those of navigation. It is understood that for the Fort Snelling Military Reservation, in the immediate vicinity, the Government is paying about $15,000 annually for electric power generated and furnished by private enterprise, and that large sums are also expended for similar service in the various public buildings in the two cities of St. Paul and Minneapolis. The water power resulting from the improvement could be applied to meeting these expenses, either directly, by means of a Government plant, or, indirectly, through leases to municipal or private corporations; and, aside from the question of an improved navigation, there would seem to be no doubt of the wisdom of providing for such expenditures in the manner proposed, nor of the constitutional power of Congress to do so.

I am constrained, therefore, to conclude: (*a*) That from the standpoint of navigation and other Federal interests it would be advisable to modify the existing project in such manner as, while better serving those interests will permit the creation and utilization of a valuable water power which can be applied to minimizing the cost of construction; (*b*) that instead of inviting the cooperation of and entering into contractual relations with any private or municipal corporations for the execution of the work (a policy which experience has shown to be conducive to friction and misunderstanding, and often attended by serious complications) the cost of construction should be borne by the United States alone, so that the control of the water power will be absolute, and it may be used, leased, or otherwise utilized as may be most advantageous to interests of the Government.

To carry out the foregoing proposition I recommend that Congress make provision for constructing a high dam and modifying the present lock in lieu of building a low dam and an auxiliary lock. The cost of constructing a high lock and dam will exceed the cost of completing the present project, modified as recommended by the Board of Engineers for Rivers and Harbors, as follows:

30-foot lock and dam (including lowering floor and miter sill of existing lock)	$200,000
Flowage rights over private lands	80,000
Flowage rights over city lands	100,000

From this should be deducted the cost of repair and reconstruction of Lock and Dam No. 2, which will be necessary if the present project is adhered to and which is estimated at $50,000. A still further reduction may be made by obtaining the easement of flowage over city lands at a nominal cost. The two cities of St. Paul and Minneapolis are deeply interested in the construction of a high lock and dam, and in addition are naturally the most desirable lessees of any surplus power that may be created thereby. Through assurances of reasonable and proper concessions to them in the matter of leasing such surplus power it is thought to be possible to secure a voluntary donation of the right of flowage over their lands. It is therefore recommended that negotiations to this end be had with the proper agencies of these municipalities before resorting to condemnation proceedings, which would be both tedious and costly.

Very respectfully,

W. L. Marshall,
Chief of Engineers, United States Army.

The Secretary of War.

SAN DIEGO HARBOR, CAL.

Following is the report of the Board of Engineers on a recent survey, printed in House Document No. 1309, Sixty-second Congress, third session:

Board of Engineers for Rivers and Harbors,
January 21, 1913.

To the Chief of Engineers, United States Army:

1. San Diego Harbor, Cal., has been improved by the United States by the construction of a dike and jetty and by dredging on the bar and middle ground. The existing project, adopted by the act of June 25, 1910, provides for dredging a channel through the outer bar 30 feet deep and 600 feet wide, and a channel through the middle ground 30 feet deep and 400 feet wide at its southerly end, widening out at the northerly end. Expenditures on all projects to June 30, 1912, amounted to $809,819.57.

2. The act ordering the present investigation does not specify the extent of the further improvement contemplated. Local interests desire that the United States open the harbor to ships drawing 35 feet. The district officer states that the San Diego bar is generally smooth and the middle-ground channel always so. The present channels are of such capacity that at low water, in ordinary weather, vessels drawing 28 feet can safely enter and depart, but in rough weather it would not be safe for a vessel drawing over 25 feet to attempt to use the bar channel at low water. Present depths are more than ample for most of the vessels that trade between San Diego and points in California, Oregon, and Washington, but the ships of the American-Hawaiian Line, which touch at this port, draw as much as 27 feet, and it is stated that new ships of this line will draw 29 or 30 feet. These ships will require for the safe navigation of the entrance at all stages and in all weathers a depth of as much as 35 feet at mean lower low water.

3. Having in mind the fact that this is the nearest Pacific home port to the Panama Canal, and that vessels drawing as much as 30 feet will engage in trade which will bring them close to this harbor and into which they would come for various purposes if sufficient depth were available, the district officer is of opinion that it is advisable

for the United States to provide some increase of navigation facilities at this locality. Following the suggestion made in his report on preliminary examination, the papers in the case were referred to the Navy Department for an expression of its views as to the further improvement, if any, required in the interests of the Navy. Estimates are now submitted for the work required in the interests of commerce and that suggested by the Navy as follows:

(1) Bar channel 35 feet deep and middle ground channel 32 feet deep, as formerly suggested by the Navy Department	$208,786
Annual maintenance of above	19,289
(2) Bar channel 40 feet deep and middle ground channel 35 feet deep, over limits now suggested by the Navy Department, as indicated on map	1,063,696
Annual maintenance of above	47,533
(3) Bar channel 40 feet deep and middle ground channel 35 deep, within limits indicated on map	388,637
Annual maintenance of above	22,067

4. The district officer is of opinion that the cost of further improvement in accordance with the first estimate given above, viz, $208,786, with $19,289 yearly for maintenance, is reasonable in comparison with the advantages to be obtained, and the work is reported by him as worthy of being undertaken by the United States in the interests of commerce. He makes no recommendation as to the adoption of the project desired by the Navy Department, and calls attention to the fact that the cost of the work on the middle ground may be reduced nearly $700,000 by the third plan and estimate above referred to, and states: "This plan will afford a safe entrance to capital ships of the Navy and is inferior to the Navy plan only in affording a less convenient approach to the Navy coal wharf."

5. After consideration of all data available, including that bearing upon the extensive terminal development proposed by and at the expense of the city of San Diego, the board concurs with the district officer in believing that some increase of depth at this harbor is warranted by the present and prospective demands of commerce. It believes that the plan contemplating a depth of 35 feet on the bar and 32 feet across the middle ground will reasonably well provide for these demands, and it is therefore of opinion that it is advisable for the United States to undertake this improvement, at an approximate estimated cost of $210,000, with $20,000 annually for maintenance. The full amount of the estimate should be provided in one appropriation.

6. It is recommended that the accompanying correspondence, setting forth the views of the Navy Department respecting its needs, be forwarded with this report for the information of Congress.

7. In compliance with law, the board reports that there are no questions of terminal facilities, water power, or other subjects so related to the project proposed that they may be coordinated therewith to lessen the cost and compensate the Government for expenditures made in the interests of navigation.

For the board:

Wm. T. Rossell,
Colonel, Corps of Engineers, Senior Member of the Board.

The Chief of Engineers concludes his letter of submission as follows:

After due consideration of the above-mentioned reports, I concur in general with the views of the district officer and the Board of Engineers for Rivers and Harbors, and therefore, in carrying out the instructions of Congress, I report as follows: That the improvement by the United States of San Diego Harbor, Cal., including both the inner harbor and the bar entrance is deemed advisable in the interest of general navigation so far as to secure an available harbor or channel depth of 35 feet and a channel width of 570 feet on bottom through the outer bar, and a depth of 32 feet over the area of the middle ground indicated on the accompanying map, following in general the methods described in the reports of the district officer, at an estimated cost of $208,786 for first construction and $19,289 annually for maintenance, these estimates being based on the supposition that the construction work will, as now seems desirable and advantageous, be prosecuted under a first appropriation of the full amonnt of the estimate.

It is believed that the above improvements will provide all that is at present needed by general navigation, and the correspondence with the Navy Department and the estimates based thereon are transmitted herewith for the information of Congress in case it desires to exend the improvement further in the interest of that department.

W. H. Bixby,
Chief of Engineers, United States Army.

A statement of the commerce of this harbor is printed in the report on the present project, page 506 of this volume.

Following is the correspondence with the Navy Department alluded to above:

WAR DEPARTMENT,
OFFICE OF THE CHIEF OF ENGINEERS,
Washington, December 16, 1912.

From: The Chief of Engineers.
To: The Secretary of War.
Subject: Improvement of San Diego Harbor, Cal.

1. Among the localities for which preliminary examinations and surveys were authorized by the act of July 25, 1912, was "San Diego Harbor, Cal., including both the inner harbor and the bar entrance."

2. The report on preliminary examination has just been received at this office and recommends that a survey be made in order to determine the extent and advisability of the improvement.

3. As it is thought that the Secretary of the Navy may be possibly interested in the proposed improvement, it is suggested that he be requested to advise you of his wishes in the matter, and for a clear understanding of the matter it is suggested that the improvement desired by him, if he desires anything, be indicated upon one of the accompanying blue prints, and that it be returned with his letter expressing his views.

W. H. BIXBY,
Chief of Engineers, United States Army.

[First indorsement.]

WAR DEPARTMENT, *December 16, 1912.*

To the Secretary of the Navy, with request for his views and wishes in the matter. Early action in the matter will be appreciated.

ROBERT SHAW OLIVER,
Assistant Secretary of War.

[Second indorsement.]

DECEMBER 17, 1912.

From: Secretary of the Navy (Division of Operations).
To: The President General Board.
Subject: Improvement of San Diego Harbor.

1. Referred for recommendation as to the improvements which should be indicated, as suggested in paragraph 3 of this letter.

G. v. L. MEYER.

[Third indorsement.]

DECEMBER 19, 1912.

From: President General Board.
To: Secretary of the Navy.
Subject: Improvement of San Diego Harbor.

Returned.

2. The geographical situation of San Diego, 450 miles south of San Francisco, close to the Mexican border, and the nearest United States port to Panama on the Pacific coast, points to its being a frequent port of call for the Navy as well as for commercial vessels when the canal is in operation. The Navy now has a coaling wharf at San Diego, and the harbor is used as a base for a part of the drills of the Pacific Torpedo Flotilla; the capital ships of the Pacific Fleet are at this date engaged in target practice in the immediate vicinity. The General Board believes it probable that the naval use of this port will increase in the future rather than the reverse. There is room in the inner harbor for at least 16 capital ships in quiet, perfectly protected water, and there is now a limited coast defense.

3. For all the reasons outlined above it is desirable that a depth of 35 feet over the middle ground and 40 feet over the bar be provided to permit the entrance at all times to the inner harbor of capital ships of the Navy, which will probably draw as much as 32 feet in the next designs. The channel opposite the naval coaling wharf should be widened and straightened to permit an easy turn of vessels of great length and draft. The General Board therefore recommends the survey mentioned in paragraph 2 of the letter of the Chief of Engineers. The limits of the desired channel are shown on the accompanying blue print.

4. In its letter, No. 404, of March 18, 1909, the General Board adheres to its "opinion, heretofore expressed, that it is not good policy, economical, or desirable, from a naval standpoint, to establish a naval station on the coast of California south of San Francisco." The expressions above regarding the desirability of having the inner harbor of San Diego available for capital ships of the Navy are not to be taken as a reversal of opinion in this respect.

GEORGE DEWEY.

NAVY DEPARTMENT,
December 19, 1912.
Approved.

BEEKMAN WINTHROP,
Acting Secretary of the Navy.

NAVY DEPARTMENT,
Washington, December 19, 1912.

From: Acting Secretary of the Navy.
To: The honorable the Secretary of War.
Subject: Improvement of San Diego Harbor.

1. Referring to a letter from the Chief of Engineers, United States Army, of recent date, forwarded by you, relative to the improvement of San Diego Harbor, there is forwarded herewith the original papers in this matter with the recommendation of the General Board, which has been approved by this department.

2. It is requested that these papers be returned when they shall have served their purpose.

BEEKMAN WINTHROP.

TILLAMOOK BAY AND BAR, OREG.

Tillamook Bay is an indentation of the Oregon coast about 6 miles long and 3 miles wide, with a tidal area of about 13 miles. It lies about 50 miles south of the entrance to the Columbia River. At low tide the bay is a succession of sand and mud flats, separated by several channels which gradually shoal at their upper reaches from 1 to 2 feet at low tide. The controlling channel depth on the bar is generally about 14 feet at mean low tide. Vessels drawing from 14 to 15 feet can reach Hobsonville on the Bay City channel, a short distance from the entrance. Originally the controlling depth at ordinary high water between the ocean and Tillamook, on Hoquarten Slough, 12 miles from the entrance, did not exceed 7 or 8 feet.

The original project for the improvement was adopted by the river and harbor act of August 11, 1888, and provided for a survey of the entrance and for the improvement of Dry Stocking Bar and Hoquarten Slough by the building of pile dikes, at an estimated cost of $5,200. The total amount expended on this project was $5,700.

The second project, adopted by the act of July 13, 1892, provided for connecting the north and middle channels nearly opposite Bay City, on the north shore of Tillamook Bay, putting in dikes at Junction and Dry Stocking Bars, and contemplated a least depth of 9 feet at mean high tide from Hobsonville to Tillamook, on Hoquarten Slough. The estimated cost was $100,000.

The amount expended on this project at the close of the fiscal year ending June 30, 1912, was $136,142.51, of which amount $63,669.14 was applied to maintenance. There was received from sales the sum of $20.

The river and harbor act approved July 25, 1912, adopted a new project, printed as House Document No. 349, Sixty-second Congress, second session, which contemplates the construction of a north jetty at the entrance to the bay, and dredging the channel to Bay City 16 feet deep and 200 feet wide, increased at the entrance and at curves, at a total cost of $814,000, with $5,000 annually for maintenance, the local interests cooperating to the extent of paying one-half the cost, and creating and maintaining a depth of 9 feet at mean high water between Bay City and Tillamook. An appropriation of $100,000 is carried in the act, and when an equal amount is furnished by the local interests active operations will be commenced on the project.

The work of repairing the dredge, which was in progress at the end of last fiscal year, was completed about August 31, 1911, the dredge placed in commission, and operated on Government funds during the month of September, 1911, having dredged 8,320 cubic yards of material from the channel of Hoquarten Slough. On October 1, 1911, owing to lack of available funds, the dredge was turned over to the port of Tillamook, to be operated at its expense in maintaining the projected channel between Tillamook and Bay City. Seventy-three thousand seven hundred and sixty-three cubic yards of material was removed up to June 25, 1912, when the dredge was laid up, owing to lack of funds to continue the work.

All of the work contemplated by the project of 1892 has been completed, and, except as shoals are formed by each freshet, boats have experienced little difficulty in reaching Tillamook at high tide on a draft of 9 feet. The average range of tide is 6.2 feet. The head of navigation for ocean-going vessels is at Tillamook, about 12 miles from the entrance.

Lumbering is one of the chief industries, and logging is extensively carried on, most of the tributaries of Tillamook Bay being used as a means of floating logs down to tidewater.

The commerce on Tillamook Bay consists of lumber and dairy products shipped to Portland and San Francisco and general merchandise brought in by coasting vessels. During the calendar year this traffic amounted to 26,024 short tons, valued at $2,630,480.

There is now railroad connection with Tillamook Bay, the line connecting with the Southern Pacific at Hillsboro, 21 miles west of Portland, having been completed in the fall of 1911.

The estimate submitted for expenditure in the fiscal year ending June 30, 1914, is the amount required to complete the new project adopted by the act of July 25, 1912, all of which ($307,000), it is believed, should be made available at the same time for either contract or expenditure, as circumstances may determine.

Comparative statement of traffic.

Calendar year.	Short tons.	Estimated value.	Calendar year.	Short tons.	Estimated value.
1902	24,883		1907	22,917	$1,246,710
1903	16,862		1908	19,400	1,098,990
1904	13,823	$658,489	1909	25,025	2,913,955
1905	13,919	696,760	1910	21,898	2,467,080
1906	13,627	850,240	1911	26,024	2,630,480

Amount (estimated) required to be appropriated for completion of existing project	$307,000
Amount that can be profitably expended in fiscal year ending June 30, 1914, for works of improvement	307,000

VALDEZ, ALASKA.

War Department,
Washington, April 8, 1912.

My Dear Senator: Replying to your letter of 6th instant, requesting the views of the department on Senate bill 5272, "appropriating $75,000 for the protection of Valdez, Alaska, from glacial floods," provided the body and title of the bill is amended to indicate its real purpose to protect Government property against glacial floods, etc., I beg to quote, for your information, the following extracts from telegraphic reports of July 29 and August 5, 1911, by Lieut. Col. W. P. Richardson, chairman of the Road Commission of Alaska:

"Conditions somewhat serious, some lives endangered, and considerable destruction of property already might easily extend to signal office, courthouse, and other public buildings. Situation likely to reoccur any time in summer, and in my opinion warrants examination with view to giving some permanent aid by the Government for protection of public buildings and maintaining terminal military telegraph line and road.

"* * * Signal Corps buildings and terminals occupy portion of ground selected and reserved in 1898 as a base for the exploration of a trail into the interior. The district court and Federal jail buildings adjoin these on one side, and the post office in a War Department building on the other side. Around these buildings as a center and along the shore of Valdez Bay the town of Valdez has grown up, and the houses occupied by the various Federal officials and employees under the Government form an integral part of the town. The buildings occupied by the road commissioner are rented. The Valdez glacier lies 4 miles back of the town, and its waters from the summer melting flow through numerous and constantly shifting channels across a flood plain from 1 to 3 miles wide into Valdez Bay. A few consecutive days of warm weather in summer brings down a great quantity of water, which in the absence of any diverting dike spreads through the streets of the town, cutting deep channels and undermining and carrying away houses. Several days before my telegram of 29th, the garrison of Fort Liscum came over to aid in protecting the signal office and the property of Lieut. Weeks, of the road commission, whose house was caught almost in mid-channel of one of the streams through the town. The garrison has been called upon in past years to give assistance, and the citizens of the town have expended about $40,000, besides a vast amount of voluntary labor, in an attempt to construct protecting dikes and divert the waters on each side of the town. This work has been done, however, by piecemeal, generally under the stress of immediate danger and without any well-defined plan or competent direction. In my judgment the waters can be successfully diverted and permanent protection given to the public buildings and terminals at a reasonable expenditure, probably not to exceed fifty or sixty thousand dollars. Certain portions of the town outlying and in the lower part would of course have to be protected by the citizens themselves. The situation at present is unchanged since my last telegram, except that the waters have been partially turned out of the town by temporary dams and immediate danger averted, and the season is now too far advanced to do more than continue this form of protection until the waters subside. * * *"

On these reports, Maj. James B. Cavanaugh, Corps of Engineers, United States Army, was ordered to proceed to Valdez for the purpose of furnishing an estimate and recommendation in the matter, which he submitted to the department, giving estimate of cost at $55,000.

Col. Richardson further states that there was no town at this point until the establishment of the Government terminals of the road, telegraph, and cable system, and that the War Department is to that extent responsible for the building of the town; that while the town will get an incidental benefit from the work proposed, the War Department has, on the other hand, already received benefit and protection by the work of the settlers in their effort to protect themselves.

In view of the foregoing, the department recommends favorable consideration of the bill for the purposes indicated, subject to the amendments proposed by you, viz, the protection of the War Department's property, embracing the cable office, terminals of cable and telegraph system, and the military road to the interior of Alaska.

Very truly, yours,

Robert Shaw Oliver,
Acting Secretary of War.

Hon. Knute Nelson,
Chairman Committee on Commerce, United States Senate.

INCREASES AND DECREASES AS REPORTED TO SENATE.

State.	Project.	Document.	Increase.		Decrease.
			Appropriation.	Contract authorization.	
Alabama	Channel connecting Mobile Bay and Mississippi Sound.		$20,000		
Arkansas	Arkansas River in front of Crawford County levee.		30,000		
California	San Diego Harbor	1309 (62d, 3d)	388,637		
Connecticut	New Haven	1258 (62d, 3d)	80,000		
Florida	Channel St. Johns River, Fla., to Cumberland Sound.	898 (62d, 2d)	50,000	$51,000	
Do	Lake Crescent and Dunns Creek.	1320 (62d, 3d)	25,000		
Do	Hillsboro Bay				$100,000
Do	Anastasia Island		15,000		
Georgia	Fancy Bluff Creek	1342 (62d, 3d)	8,000		
Do	Savannah River at Augusta.	1319 (62d, 3d)	60,000		
Maine	Bass Harbor Bar	1128 (62d, 3d)	10,000		
Do	Deer Island Thoroughfare	1128 (62d, 3d)	40,000		
Do	Carvers Harbor	624 (62d, 2d)	16,000		
Do	Pepperells Cove		63,400		
Do	Medomac River				8,500
Maryland	Baltimore Harbor	1190 (62d, 3d)	205,250		
Massachusetts	Plymouth Harbor	1194 (62d, 3d)	83,500		
Michigan	Saginaw River	740 (61st, 2d)	100,000		
Do	Arcadia Harbor		20,000		
Do	Manistee Harbor		66,000		
Do	Menominee Harbor and River.		14,000		
Minnesota	Mississippi River and Leech River.	1223 (62d, 3d)	116,000		
	Mississippi River, Cape Girardeau to Rock Island, examination.		100,000		
Mississippi	Yazoo River (mouth)		50,000		
Missouri River	Sioux City to Fort Benton		25,000		
New Jersey	Absecon Inlet		45,000		
Do	Woodbury Creek				8,000
New York	Harlem River Ship Canal	557 (62d, 2d)	5,000		
Do	Flushing Bay	1333 (61st, 3d)	235,700		
Do	Hudson River Channel, New York Harbor.	719 (62d, 2d)	200,000	250,000	

Increases and decreases as reported to Senate—Continued.

State.	Project.	Document.	Increase.		Decrease.
			Appropriation.	Contract authorization.	
North Carolina	Cape Lookout		$500,000	$600,000	
Ohio	Cleveland Harbor		51,000		
Oregon	Willamette and Yamhill Rivers.		10,000		
Oregon and Washington.	Columbia River above Celilo Falls.		20,000		
Do	Columbia River between The Dalles Rapids and head of Celilo Falls.		600,000		
Oregon	Tillamook Bay and Bar	349 (62d, 2d)	100,000	207,000	
Rhode Island	Providence River and Harbor.	1369 (62d, 3d)	100,000	827,800	
Do	Block Island		50,000		
Do	Point Judith, harbor of refuge.	911 (60th, 1st)	100,000		
South Carolina	Winyah Bay				$55,000
Texas	Brazos River		100,000		
Do	Channel Galveston Harbor to Texas City.	1390 (62d, 3d)	300,000	1,100,000	
Do	Houston ship channel			200,000	
Virginia	Western Branch Elizabeth River.	566 (62d, 2d)	82,000		
Washington	Columbia River between Bridgeport and Kettle Falls.		15,000		
Alaska	Valdez, Alaska		55,000		

Increase appropriation	$4,154,487
Increase contract authorization	3,235,800
Total increase	7,390,287
Decrease	171,500
Net increase	7,218,787

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